INTERVIEW: PANAMSAT PRESIDENT FRED LANDMAN

AUSTRALIAN
communications

MAY 1993 The Data and Telecommunications Management Magazine $5.50

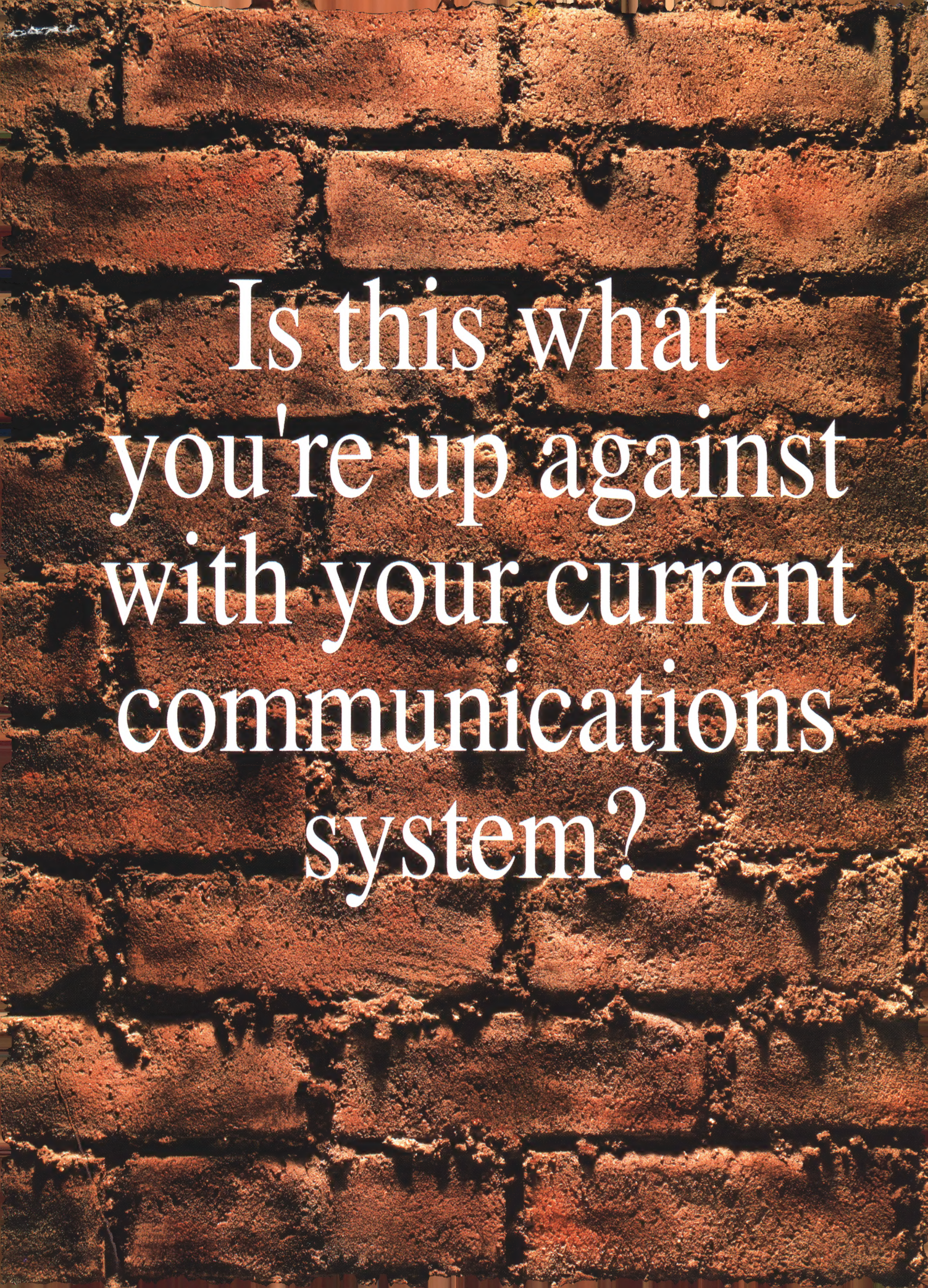
RATING FASTPAC
How does Australia's high speed MAN compare on tariffs, technology?

THE ATM REVOLUTION
eading the way to a new era of witched internetworks

NETWORK STANDARDS
s it possible to build an open, tandards-based network?

TOKEN RING ADAPTORS
valuated for enterprise equirements

MPLEMENTING ISDN
A practical guide to problems nd solutions


Is this what
you're up against
with your current
communications
system?

AT&T opens up endless possibilities with the DEFINITY Communications System.

Face it. You've spent hundreds of thousands of dollars to bring your company's phone system into the eighties. Only to discover it can't make it into the nineties. Do You: a) Admit you're only human. b) Try to squeeze another six months out of your current system. c) Replace your current system with the latest model that's built for obsolescence. d) Invest in the last communications system you'll ever need.

If you answered 'd,' your choice is AT&T's DEFINITY Communications System. That's because the DEFINITY Communications System is the only system with a modular configuration that takes you from 40 lines to a seemingly endless 30,000.

In most cases, you can add those extra lines, simply by adding on to the modular base. And AT&T the world's largest Telecommunications Company now in Australia, can help you plan those additions, so you don't have to shut out your customers' calls.

So if your old PABX has brought you to a dead end, the DEFINITY Communications System can turn your fortunes around.

To find out more about the DEFINITY Communications System, contact your AT&T Account Executive, or call (02) 352 9000 Fax (02) 352 9111.

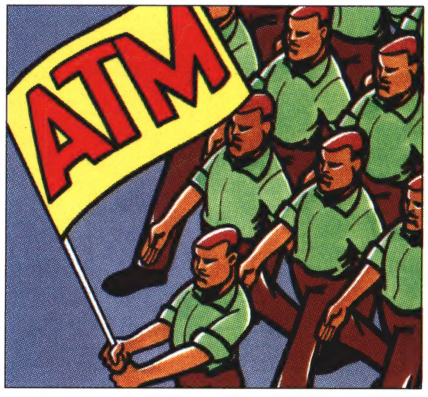
For PABX technology, it's a breakthrough.

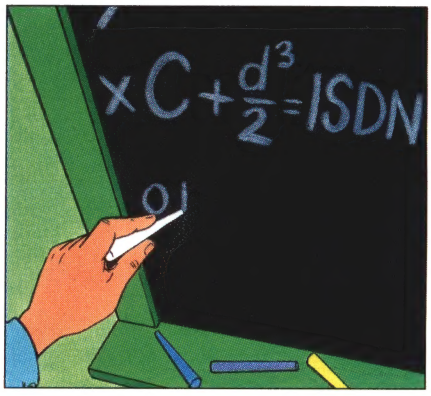
AT&T
The right choice.

AT&T BUSINESS COMMUNICATIONS SYSTEMS AUSTRALIA, 4A LORD STREET, BOTANY 2019.

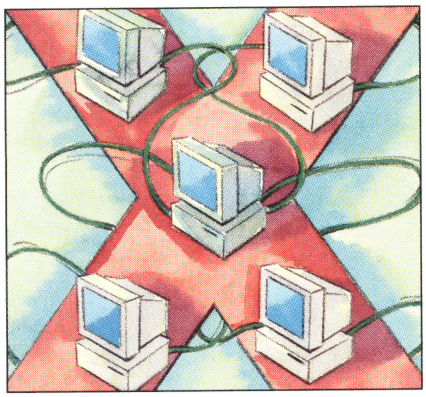
AUSTRALIAN
communications

Cover: John Dymond Photography





MAY 1993



STANDARDS-BASED NETWORKING 117

Networking vendors use the words 'open' and 'standard' with great and often unqualified enthusiasm, but what exactly do they mean when applied to LANs? Vendor hype aside, is it practical or even possible to build an open, standard local area network? Graeme Le Roux grapples with the real meaning of both words and applies his definitions to a typical networking scenario to try and find the answer. His conclusion? It is possible, but it's expensive.

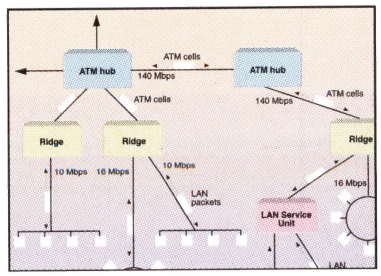
TELECOMMUTING 125

Futurologists have long predicted the advent of the 'Wired City,' a place where office workers can do most of their work, banking and shopping from home. This telecommuting idea is fashionable and sounds appealing — but can it catch on? The technology may work, but do people want to use it? Tom Forester examines the progress of a number of worldwide trials of the concept, and reaches some unfashionable conclusions.

ANALYSIS

TECHNOLOGY

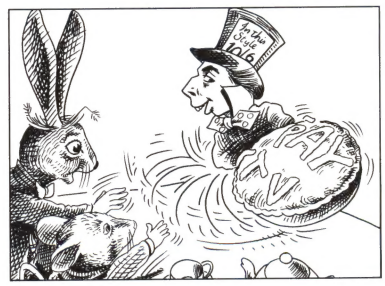
PRODUCT LEADERS



OPINION

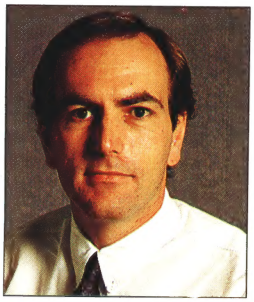
INTERVIEW

LEGAL LINE



DEPARTMENTS

Another Year, Another Minister



ATUG'93 will probably be a good time to wish this week's Communications Minister good luck for the future. After all, as the sixth Communications Minister in four years, David Beddall will need some help to get on top of an always complex and often confusing portfolio. Hopefully, that help will also assist him in getting over the negativity surrounding his appointment.

To begin with, his appointment coincides with the relegation of the Communications portfolio to the outer ministry. For an industry in which the Prime Minister is said to have a personal interest, many found this surprising and (in ATUG's view) disappointing. Does it mean that the Government has ticked the telecommunications industry off its microeconomic reform To-do list? Has the Prime Minister's pre-election pledge to his supporters to preserve Telecom and keep it safe from the clutches of private owners effectively placed it, and, by extension, the industry out of reach for a while? Indeed, has the appointment of yet another politician without a track record of an interest in the industry effectively nobbled any serious decision-making for the foreseeable future?

In addition to these rumblings about his status, he has also had to deal with the absurdity of the postponed Telecom and Optus GSM launches. Why the GSM security question wasn't dealt with one way or the other, instead of being allowed to drift along and finally cause the embarrassment of the aborted launch is something I'm sure he'd like to keenly pursue with staff in his new ministry.

And while he's talking to those staff, he might also like to discuss a new 'truth in advertising' code for telecommunications licence bidders. Remember Arena GSM — the Vodafone-backed third mobile licence bid 'consortia' that was at one stage going to create 5,000-10,000 jobs? It's now known as Vodafone, and the UK company is no longer pretending to be part of a consortia with Australian interests. It is also now saying in advertisements that it will create in excess of 1,000 jobs.

If these concerns don't keep him busy, then dealing with the many preselection ballot-based issues that will crop up probably will. Let's hope he understands it a little better than Australian Democrats Leader, Senator John Coulter, who wrote to the *Australian Financial Review* last month complaining about how Optus and Telecom were planning to spend $160 million on advertising: 'the one trying to encourage us to put a '1' in front of each number we dial, the other trying to encourage us to leave the '1' off.'

MA Smeaton

AUSTRALIAN communications

EDITOR
Mark Smeaton

CONTRIBUTORS
Tom Amos, Stewart Fist, Liz Fell, Peter Leonard, Peter Waters, Stuart Corner, Graeme Le Roux, Bill Bennett, Bernard Levy, Shelley Spriggs, Robert Clark

ASSISTANT EDITOR
Sarah Parkes

PRODUCTION MANAGER
Samantha Keats

ILLUSTRATIONS
Samantha Keats, Louis Silvestro

NATIONAL SALES MANAGER
Craig Burkill

Subscriptions
Australian Communications is available by paid subscription for $54 per annum. Subscribers receive eleven issues per annum.

Overseas Rates by Air	1 Year	2 Years
New Zealand, Papua New Guinea	$66	$110
Singapore, Indonesia, Malaysia, Brunei, Pacific Islands	$72	$122
Asia — including Hong Kong, India, Korea, Japan, Taiwan	$78	$133
Europe, North America, Middle East, South America	$92	$168

Publishers
Published and distributed monthly by Ostasun Pty. Ltd. (ACN 003 606 102) under licence from ACP Computer Publications, a division of ACP Publishing Pty. Ltd. (ACN 053 273 546) of 54 Park Street, Sydney NSW 2000. ISSN 0818-9021. **Address:** Level 4, 541 Kent Street, Sydney NSW 2000. **Tel:** (02) 264 2200 **Fax:** (02) 264 2244.

Printed at **Offset Alpine Printing**, Derby & Wetherill Streets, Silverwater NSW 2141


Level 5 UTP cable is only one part of your structured wiring system...
...are you gambling with the rest?
You could be if you don't install a complete end-to-end, high-performance system.
To ensure that your demanding business applications run without fail today and tomorrow, call the Physical Layer Experts at Anixter. We can help you determine the best system to suit your company's long-term networking needs.
Our complete inventory of Level/Category 5 cable and connecting hardware from the industry's leading manufacturers, combined with our technical expertise, provides you with what you need when you need it.
So, don't gamble with your system's performance . . . call Anixter today.
PATCH PANELS
PUNCH-DOWN BLOCKS
INFORMATION OUTLETS
PATCH CABLE ASSEMBLIES
ANIXTER
Global Wiring Systems Specialists
SYDNEY: 61 2 333 0800
MELBOURNE: 61 3 526 3617
ANIXTER AUSTRALIA PTY LTD: Unit 6, Waterloo Business Centre
44-48 O'Dea Avenue, Waterloo NSW 2017
© 1993 ANIXTER BROS., INC.

Austel Resolves Early Ballot Deadlock

Industry regulator Austel was forced to break an early deadlock in negotiations between Telecom and Optus as the carriers last month began gearing up for what could be Australia's most expensive electoral contest ever — the great preselection ballot.

At issue was AOTC's 0015 international fax service which AOTC claimed should, as an enhanced service offering, be excluded from the balloting process. Optus disagreed, and both carriers requested a ruling from Austel to resolve the matter. In its determination, Austel found in favour of AOTC and ruled that customers should be able to select and access the international facsimile service of each carrier by dialling a carrier-specific service access code. Austel also ruled that AOTC would retain the 0015 code and that Optus be allocated another 001X code by July 31.

Expected to take a major slice of an estimated $150 million to be spent by the carriers on advertising over the course of this year, preparations for the preselection ballot are now on in earnest. AOTC has signed up John Singleton Advertising to manage its preselection campaign, while Optus has enlisted the services of Australian National Opinion Polls to help win the battle for the hearts, minds and wallets of Australians. Both organisations have been closely associated with the ALP's electoral success in recent years.

Although it was generally expected last month that balloting would get underway by the middle of this year, the carriers were still locked in discussion over the precise terms and conditions of the contest. Mounting pressure from the Communications Workers Union to abolish or defer the plan was rejected by the new Minister for Communications, David Beddall, who reportedly maintained that it was his firm view that it should go ahead by August.

Keating Names New Minister

Australia has a new Minister for Communications, the Member for Rankin (Qld), David Beddall. Mr Beddall has been a MP since 1983, and previously served as the Minister for Small Business, Construction and Customs. He was Minister for Small Business and Customs in the Hawke Government, and has served on a number of Parliamentary Committees.

Before entering Parliament, Mr Beddall was a self-employed commercial financial consultant specialising in the financing of equipment and purchases for small to medium-sized businesses. He migrated to Australia in 1954 from the UK, and is a naturalised Australian.

David Beddall

Telecoms Exports Up in 1992

Exports of Australian-produced telecommunications equipment increased by over 25% to $360 million in 1992, according to the Executive Director of the Australian Electrical and Electronic Manufacturers Association, Mr Alex Gosman.

Mr Gosman said that exports have quadrupled since 1988, and attributes the strong growth to investment by the industry in advanced manufacturing facilities and research and development, an orientation towards international sales, a close relationship with the carriers, and the Government's industry policy arrangements.

Major exports include customer premises equipment, cabling, network equipment, mobile phones and data communications equipment.

Mr Gosman said nearly 50% of exports are sent to the Asian region, where opportunities are growing due to rising living standards and demand for advanced communications facilities. He added that the Partnership for Development program has acted as a major catalyst for increased export growth.

Datacraft Restructures in Asia

Buoyed by recent strong performance, Datacraft has moved to restructure its extensive Asian operations.

Subject to approval by an Extraordinary General Meeting of shareholders late last month, the restructuring will see Datacraft sell its shares in all six of its Asian subsidiaries for $16.4 million to Datacraft Asia, a new holding company to be incorporated in Singapore. Another member of the Datacraft Group, Datacraft Asia Holdings, will have a 74% stake in the new company and minority interests will be held by Asian financier, Transpac Capital (22%), as well as senior staff members at Datacraft's Asian offices.

Datacraft has subsidiaries in Hong Kong, China, Singapore, Thailand and Taiwan. Group Chairman, George Kepper, said the restructuring would bring several benefits, including a reduction in group debt and additional capital for growth.

Datacraft recently reported a $0.7 million profit as well as a 21% boost in global revenues to $47.2 million for the six months ended December 1992. Australian sales rose by 27% to $25.7 million for the period.

The Great GSM Farce

The scheduled launch of GSM digital mobile communications technology in Australia fizzled last month with Telecom and Optus forced to postpone their launches after objections by ASIO and other Australian law enforcement agencies.

Under their mobile licence conditions, the carriers must be able to guarantee law enforcement agencies access to all transmissions. With the highly-secure GSM technology, this access apparently cannot be guaranteed.

Incredible as it may be, the problem seemingly only came to a head at the last moment, although it was reportedly first raised with then Transport and Communications Minister, Bob Collins, in January.

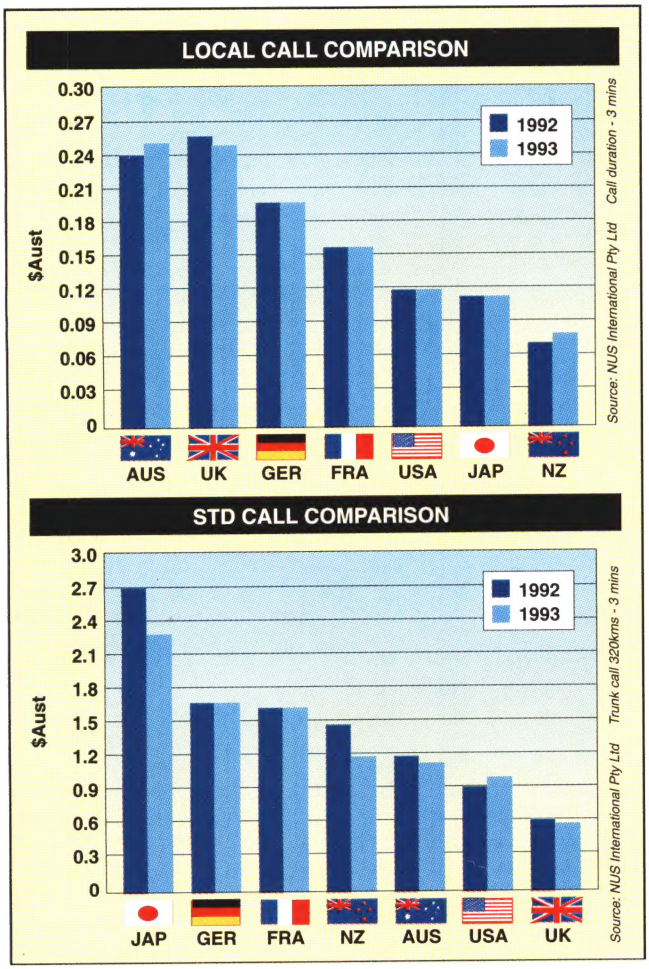
Clearly, the postponement was not anticipated by the Telecom MobileNet PR machine, which organised a GSM launch party at a Melbourne nightclub on March 31. The party went ahead anyway, but a hastily-released statement only hours before the GSM service launch advised that it had been postponed until further notice.

Speaking shortly after the postponement, new Communications Minister, David Beddall, said that it was up to the Attorney-General to work with all parties to fix the problem.

Sydney HQ For Vodafone

No doubt helped along by a reported $1.8 million package of R&D and payroll tax incentives from the NSW State Government, Vodafone has plumped for Sydney as its Asia-Pacific regional headquarters. According to NSW Premier, John Fahey, the decision will mean an investment of around $400 million in the State.

Winner of the third mobile carrier licence under the name of Arena GSM, Vodafone has also announced the appointment of John Rohan as its Australian Managing Director.



Australia's Expensive Local Calls

With local calls currently at 25 cents, Australia has the most expensive local telephone calls in the Western World, according to a 12-nation survey by telecommunications cost analysts NUS International.

This is the first time Australia has topped the survey. Previously, it always ran a close second to the UK, but BT recently reduced its prices by 2.4%.

The survey looked at the UK, Australia, France, Belgium Germany, Sweden, Italy, the US, Holland, Japan, New Zealand and Canada. It was based on three-minute comparisons, and found that Australia was only one of two countries to increase local call charges over the 12 month survey period. In April 1992, Telecom increased the cost of local calls by 4.2 %.

Telecom's New Corporate Identity

Telecom's new corporate image was announced on April 14, with the unveiling of a new logo and a change of name. The logo comprises a blue T on an orange ellipse, and supposedly represents the Australian outback and the ocean. A Telecom official said the logo projects a 'modern confident, clean image.'

AOTC will now be known as Telstra Corporation Ltd, while the overseas arm of the company will be called Telstra OTC Australia. The names have been changed to reduce confusion in the marketplace, according to Telecom. Domestically, the company will continue to use the name Telecom Australia.

The initial reaction of Telecom staff to the new corporate logo and name changes is said to have been mixed.

In Brief

NetArch, a Brisbane-based network supply and consulting company, has been named Australia's fastest growing private company in the annual BRW/Price Waterhouse listings. Its net sales have grown from $308,000 in 1988 to $11.1 million in 1992.

Cray Communications has secured a major product and marketing contract with Fiji Telecom, estimated to be worth $6 million over three years. Cray will assist Fiji Telecom in enhancing capacity and extending its range of services.

Austel is proposing changes to its cabling licensing regime, which would see the current personal licence replaced with two new licences for simple and complex installations.

ATERB — the Australian Telecommunications and Electronics Research Board — has awarded nine one-year postgraduate scholarships, each worth $11,000 tax-free. The scholarships are sponsored by AOTC, CSIRO and DSTO.

Ericsson Australia has announced that it has been recommended by BSI and Standards Australia for certification to ISO 9001. The company said it is the first telecommunications company in Australia to be recommended for BSI certification.

OTC Australia has been shortlisted in a bid to become the supplier of national telecommunications to the UK Government. Britain's Government Telecommunications Network comprises more than 250,000 users in 1,000 locations throughout the country, and handles more than 66 million telephone calls each year.

The EDI Council of Australia and the Australian Product Number Association, which administers the product number and bar coding system, have announced a jointly owned network which, according to Council CEO, Michael Baker, will eliminate most of the 60,000 photocopied pages which are produced each month to provide information to member companies.

Telecom has announced the results of an independent survey showing that its products are among the most highly regarded by consumers. The survey, conducted by AMR Quantum, rated five Telecom services in the national top 20, including the Yellow Pages, the 000 emergency service, 008 Freecall, local and STD call services and 0011 international calls.

Optus says it welcomes the defining of the MPEG 2 standard for the compression of digital video, which is expected to speed the delivery of satellite Pay TV next year. The standard means that equipment manufacturers can now begin commercial production of digital compression equipment.

Lionel Bowen, former Deputy Prime Minister and Attorney-General, has accepted the position of Chairman of the Council of the Telecommunications Industry Ombudsman (TIO). The position of Ombudsman is expected to be filled by the Council soon.

Exicom has announced it has been appointed as an Australian distributor of Octel's best-selling ASPEN Voice Information Processing Systems. Exicom's CEO, Bob Cruickshanks, said the market for voice information processing in Australia was worth up to $8 million annually, and was growing rapidly.

Telecom Enhanced Services (TES) have announced management changes for the Discovery on-line service. Mr David Rolls, General Manager of TES, has announced that he will take over the role of MD for Telesoft, marketer of Discovery. He will replace Maureen Murphy, whose resignation took effect on April 30.

Optus notched up another milestone with the official opening by ACT Chief Minister Rosemary Follett of its brand-new $15 million Canberra exchange. Optus says the exchange was built and fitted out in less than 6 months, and claims more than 25,000 Canberra residents have used its long distance service since it became available on November 15 1992.

Austel has announced final details of the new telephone numbering system, which will begin in Melbourne and Brisbane in mid-1995. All local numbers will become a standard 8 digits with the addition of a new digit before the old number, and the existing 54 STD area codes will be reduced to four: 02 for NSW and the ACT, 03 for Victoria and Tasmania, 07 for Queensland, and 08 for Western Australia, South Australia and the Northern Territory.

In Brief

Germany's IT industry may have been taking a bashing recently, but telecommunications sales rose 7% net, according to electrical industry association the ZVEI. Overall revenues, however, fell by DM3 billion to DM37 billion last year, while the number of employees fell by 4,000 to 211,000.

VSAT licences will be mutually recognised by France, Germany, the UK and the Netherlands from May 1, with mutual recognition by other countries expected. Companies wanting to run a VSAT-based business network or satellite news gathering earth stations need only apply for a licence to one of the four.

Unisource Business Networks (UBN) has announced its first non-Dutch, non-Swedish customer. The European Savings Bank Financial Services Company has signed a five-year contract to link banks in Spain, Germany, Belgium, France, Norway, Sweden, Luxembourg, Portugal and Italy.

The European Radiocommunications Committee (ERC) will launch a second investigation into the use of radio spectrum in Europe. It will examine ways of optimising the frequency band 29.7MHz-960MHz, and will report by 1995.

BT could be first to offer users international multimegabit connections via an international MAN. The British carrier recently placed orders with GPT and Siemens for EWSM switches, user interfaces and a network management system.

Swiss PTT Telecom launched its GSM network, Natel-D, on March 9. The network will cover 90% of Switzerland's populated areas by late 1995, and accommodate 400,000 subscribers.

Deutsche Bundespost Telekom has taken key decisions on mobile communications, Euro-ISDN, intelligent networks and involvement in the Ukraine. A meeting of the supervisory board decided to spin off Deutsche Telekom Mobilfunk GmbH as a separate company by January 1994, approved plans to launch Euro-ISDN in December, and approved investment in a joint venture to improve telecommunications services in the Ukraine.

BT has applied to the FCC for permission to offer US corporations international virtual circuits. The move is part of a plan, code-named Cyclone, to offer virtual networking services in the US, continental Europe and the Pacific Rim. The network is expected to involved the siting of switches at some 32 centres worldwide.

France Telecom's Numeris ISDN service in 1992 mainly served subscribers with less than 100 people. A survey found that 73% of subscribers had less than100 staff; the percentage of larger firms subscribing has fallen from 65% in 1990 to 33% last year.

Latvia is planning to privatise 49% of its national network operator, Lattelkom, in the next few months. Preparations began in March, and are being conducted by Eurostrategies, a consortium based in Brussels. PA Consulting has won the contract to draw up technical specifications for a future network separated from the network of the former Soviet Union.

Marconi's new analogue videophone has been officially launched by BT, which will market it under the name Relate 2000. It has a 3 inch fold down colour screen with resolution of 128 x 96 pixels. Picture movement is slow scan at up to 8 frames per second.

Olivetti has premiered a multimedia PC which was developed with BT. Norwich Union in the UK will trial the new machine, which integrates video telephony with mainstream computer applications via BT's ISDN. It will sell for around $US7,000.

Voicecom Systems, BT's US-based voice messaging service, has acquired Async Corporation, a subsidiary of MCI Communications. Async provides voice processing services to US businesses, and BT believes the acquisition will give Voicecom annual revenues of $US65 million.

3Com has announced record orders of $US170.3 million, and record sales of $US161.4 million for the third quarter ending February 28, 1993. A 3Com official said the increase in sales reflected strong interest in products introduced during the last 12 months.

Deutsche Bundespost Telekom has decided against a second phase of its cordless local loop project, DAL. The last of the first phase connections will go in place in the next month or two.

EC Proposes Voice Liberalisation

The European Commission was set last month to formally propose the full liberalisation European voice telephony by 1998.

The EC's timetable for the introduction of competition to the voice sector is split into two distinct phases. The first phase, from 1993 to 1996, will see the liberalisation of intra-EC calls, with complete opening up of the voice sector by January 1, 1996. A mobile sector review and liberalisation of satellite communications is also planned.

During this phase, open network provision principles will be applied to voice communications and there will be increased use of alternative infrastructures for closed user groups. Cable TV networks will be used to carry services already open to competition, such as data.

The second phase, extending from 1996 to 1998 and leading to the full liberalisation of national and international sectors will see support targeted towards those countries where the network is underdeveloped, and towards the peripheral areas of the EC to ensure universal service continues.

PTT Nederland to be Privatised

The Netherlands government has agreed to sell half its shares in Royal PTT Nederland (KPN). This will include its holding in the national carrier, PTT Telecom. The sale will take place in phases, with the first round expected to go on sale in 1994.

The company will be only the third European PTT privatised, after BT and Spain's Telefonica. However, more privatisations are now planned, including Deutsche Bundespost Telekom and Portugal's CTT.

A large part of the Netherlands' telecommunications monopoly was reorganised and liberalised in 1988. Among other things, competition was introduced in areas of mobile phones and CPE but recently, there has been criticism that liberalisation was not taken far enough.

GSM Handsets Shown at CeBIT

The CeBIT trade show in Hannover saw a lot of activity on the GSM handset front. Panasonic, Sony, Grundig and AT&T/Siemens all announced handsets, as the number of German GSM subscribers rose to 300,000.

Panasonic unveiled what it claimed is the lightest and smallest GSM handportable on the market. Weighing only 245g and measuring 150mm by 53mm by 30mm, it offers 1 hour talktime and 14 hours standby.

Sony promised to deliver the most competitively priced handset, which will be available in September. The handsets from AT&T/Siemens will provide 2 hours talktime and 15 hours of standby; while Grundig's Moviline 750 provides 2 hours talktime and 12 hours standby, and is available now.

ETSI Votes Yes to IPR Proposal

The European Telecommunications Standards Institute has approved a proposal which should put an end to disputes over intellectual property rights.

An ETSI General Assembly meeting in Nice in late March voted overwhelmingly for an Intellectual Property Rights undertaking that companies will have to sign from November 1 if they want to become members.

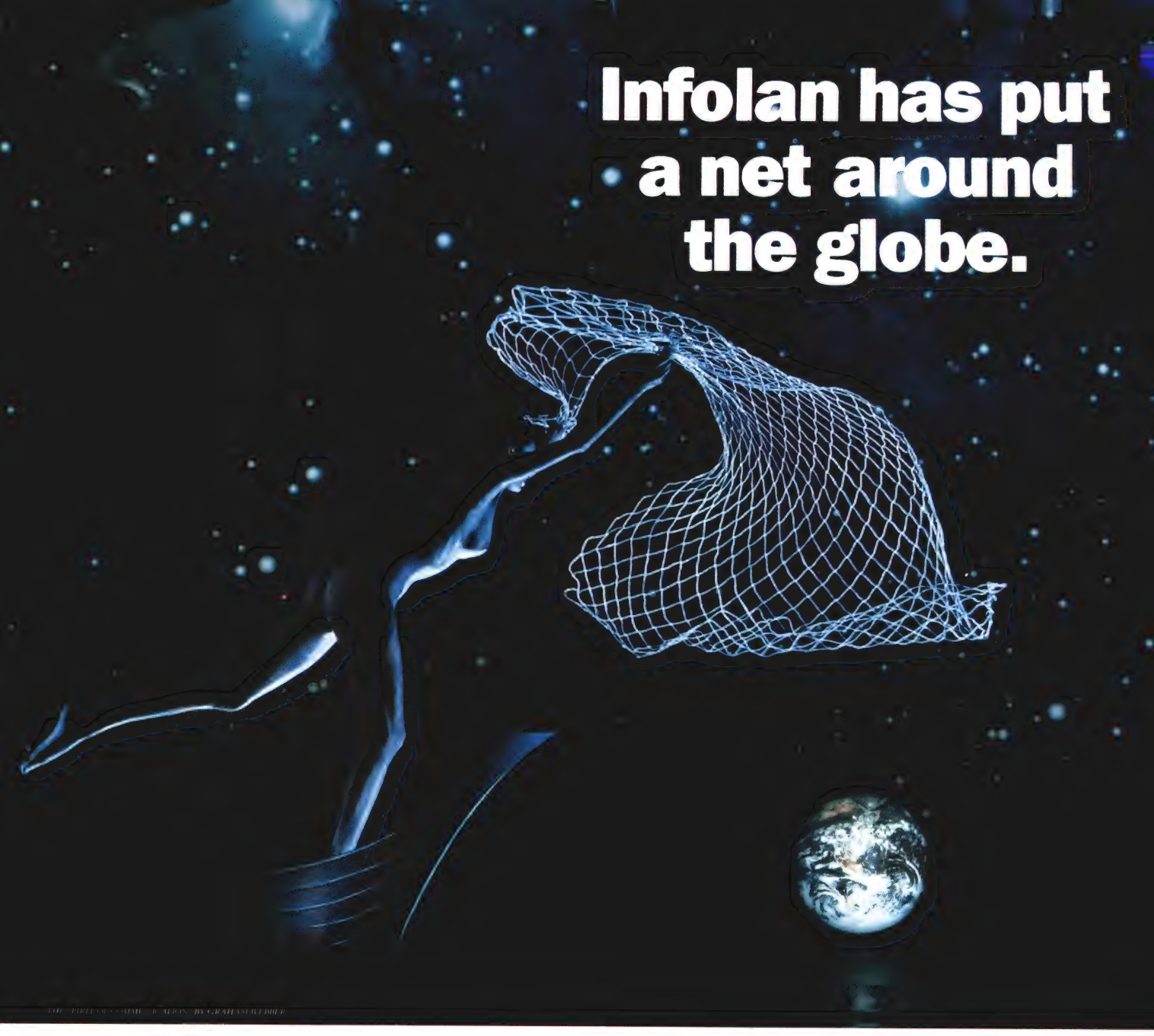
Members will be able to declare that a specific IPR is not available to the standardisation process, but, if they do not make such a declaration within a certain time limit, will have to grant licences on their inventions to other ETSI members. Licences will also have to be granted to non-members where the standard is applied on reasonable and non-discriminatory terms.

Breathe the fire of ATM into your existing Ethernet network.

ATM benefits today without scrapping your existing Ethernet investment? Yes, — only with DragonSwitch™ and VNA from Ungermann-Bass. The DragonSwitch for Ethernet — combined with our unique Virtual Network Architecture™ (VNA) software — provides powerful ATM benefits including dedicated bandwidth, multimedia support and security for autonomous workgroups across the network. Plus the unique ability to dynamically configure and reconfigure an almost unlimited number (up to 65,000) of autonomous virtual networks with point and click ease — freeing you from the physical constraints of shared networks. And all while delivering the industry's smoothest migration path to full ATM implementation in the future. So if you need ATM benefits on your Ethernet network *today*, call (03) 696 2006 for a free VNA video and your Dragon information kit.

Ungermann-Bass

Your global network integration partner

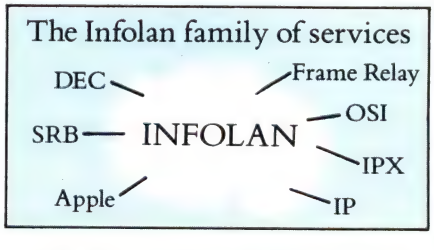


Network to network, LAN to WAN, the whole globe is now within your reach with Infonet's new Infolan service. Just imagine: you're preparing a report for the board, but first you fetch some production figures from the mainframe in Chicago; plus a CAD drawing from the facility in North London; and then you show the draft, by E-mail, to colleagues in Sydney and Auckland. You do all this in a couple of minutes as easily as if you were using your office LAN. How simple can life get?

Around the world Infolan is making global connections fast, simple and inexpensive by allowing networks to communicate with each other. That's *any* network on *any* of the major protocols and hardware systems, at minimum cost, with minimal delays. At a range of speeds all the way from 9.6 Kb to 2 Mbits.

Infonet can install your system throughout Australasia, from within your premises, to the offices at destinations anywhere in the world. We then can manage it fully, tailoring our service to your needs. So in countries where you do not want to make a major investment in technical staff, maintenance and hardware, we can handle all that for you, with no capital drain.

We know from our world-wide customer base that Infolan is the service you have been looking for – the alternative to a hugely expensive, inflexible private network. And of course being an Infonet service it's all one stop: one network, one-stop shopping, one bill.



infonet

TELEPHONE 008 035 065. (NZ 0800 44 1019.)

Playing the Litigation Card

Stewart Fist explores the reasoning behind Optus' decision to challenge Telecom's Flexiplan schemes in court.

The bad news of the month is that we are about to get our intelligence further insulted with newer and more obnoxious Flexiplan ads. Telecom has just hired John Singleton, and Optus has retaliated by contracting Rod Cameron of ANOP, to survey for weak-spots in our intellectual armour. So from now until the September 'Who-gets-your-long-haul-business' ballot, it's going to be all downhill.

I must admit that I lost count after the first 40 or so Flexiplans were announced, and my computer crashed trying to work out which was the best plan for me. But, of course, it was an exercise in futility anyway; none of this is real — it's all designed to confuse and confound the consumer, not to provide reduced costs. We shouldn't confuse verbosity with veracity. If Telecom really does have a Flexiplan for everyone, it really could save us all the bother, cut prices 10% and fire a few hundred advertising consultants.

The first of the Flexiplans was announced last November, and from the start it was obvious that Telecom was going to play brinkmanship with the competitive legislation, and test the clear intentions of the Government in establishing Austel's powers as regulator. As one (not-for-attribution) Austel staff member explained: "The Flexiplans are seen by Telecom to be very significant in its approach to the ballot. They aim to tie the public up in all sorts of Flexiplans, and it will all become so confusing that no one will be able to judge, and so they'll vote to stay with the devil they know." As a theory, this analysis has certainly gained credibility following the recent Federal Election! And it may explain why the Labor Party's two top public manipulators are now highly prized.

Most of the carrier's senior executives I spoke to (or rather, attempted to speak to) in preparing this analysis used the old 'sub judice' ploy to avoid discussing the realities and the fictions of the current game plans. Optus has now taken Telecom to the Federal Court after disagreeing with various rulings made by Austel, and the lawyers are checking out Rolls Royces again. It's not clear how much the courts are being used here for genuine adjudication, and how much they are simply providing background-scenery in a cameo where 98-pound weakling Optus demonstrates its muscle-flexing. When sand keeps getting kicked in your face, there's a stage where you send off for the Charles Atlas manual — even if you can't win the fight, you must try to look threatening.

I guess the question is whether this introduction of the Federal Court reveals the inadequacies of Austel or the competitive legislation. Is Austel a tiger or a pussy cat? Will we end up with endless rounds of court actions like New Zealand? But these rhetorical questions overstate the climate of the current dispute: no one seems to be treating the Federal Court action that seriously. Austel executives and senior staff agree that it was almost inevitable at this stage in the development of a duopoly. In the absence of water-tight legislation or a clear determination from the Minister, it is probably best to let the courts make the unpopular decisions. This leaves Austel playing nice-guy umpire; after all, who wants to be seen to be stopping Telecom giving discounts?

Legitimate Complaints

Optus has some legitimate complaints about the way in which Ministerial directions or Austel umpiring can change the rules: after all, it did contract to become the second carrier on the basis of the legislation as it was at that time — not what people might now like it to be. And it has gone to court to resolve a number of minor issues, not just for an interpretation of the legislation.

Some of Optus' complaints were to do with 'grandfathered' practices which were already in place, and which Austel allowed to continue without formal examination. Some were to do with clear and blatant uncompetitive actions, which Austel stomped on, but Telecom now disputes. And some were the result of genuine disagreement in interpretation of the legislation.

The crux of the problem seems to be that the various sections of the *Telecommunications Act* hint that Telecom's prices should all be 'cost-based,' but they don't quite say so. Instead, the Act prohibits price-discriminations (different prices for different customers) which are *not* cost-based. It's a subtle, but important, distinction. Both Telecom and Optus must file tariffs with Austel, but only the dominant carrier (Telecom) is required to charge only in accordance with its filed tariffs. Optus is free to charge whatever it wants. And this alone is a clear indication that the Parliament anticipated that Telecom would try using sharp discounting practices to disadvantage its competitor/s.

And there are questions of when Telecom is discriminating between different classes of customers, and whether these charges are in accordance with its filed tariffs; all is open to various interpretations. The whole point of Flexiplans, after all, is to attract custom by skirting around the filed tariffs. It was those Flexiplans which linked local, STD and IDD calls that were at the centre of the dispute. There were also questions of mobile 'reseller' discounts being offered to big customers, and one notorious attempt by Telecom to create a Flexiplan which only applied to mobile calls connected to Telecom's AMPS system, not to that part of MobileNet being resold under the Optus banner.

All this bundling of everything-but-the-kitchen sink with local services (where Optus couldn't compete) were clearly discriminatory, and Austel told Telecom to stop. But as one regulator explained, bundling doesn't have to be explicit (say, where you only get a discount on your local calls if you use Telecom's long-distance) it can work much more under-handedly and be just as effective.

The Act and various determinations all say that Telecom can only modify its tariffs when it can demonstrate that the 'reasonable likely costs for supply' of that service varies from normal by virtue of involving:

- Different quantities;
- Different transmission capacities;
- Different places (to and from); and
- Different supply periods.

That seems to me to be a pretty wide gap in the wall, but one can see what the legislation drafters were getting at. Coles-Myer could get its telephones at a cheaper rate than the corner store; mainframe megabytes would be carried cheaper than modem e-mail; and city-to-city traffic would be cheaper than the same distance, rural. It's conventional rational economic dogma tempered by naive marketing theory. Obviously, in the naive minds of Parliament's legal drafting section, the global market in telecommunications is not much different to that of soap powder. Judging from the 'reasonable' tariff variations, they must imagine that bandwidth is manufactured in a factory, transported on trucks, warehoused in bulk-stores, and on-sold through small retail outlets or discount supermarket chains.

Who Qualifies For a Discount?

It is assumed that all these factors go hand-in-hand with cost-based pricing. But, is there really any economy of scale in telephone or data transmissions that justifies cheaper rates for big bandwidth consumers? Obviously there is in switching, but not, as far as I can see, in transmission. Yet Telecom's price to a television network for transporting programs between transmitters represents a 97% discount (related to bandwidth) over what you or I would pay for a voice tie-line. Clearly one or the other of these prices is not 'cost-based.'

However, the legislation only deals with 'fairness' between the carriers, not equity between consumers, unless that impacts on competition. Austel is only really involved in levelling the playing field for the players — not in moderating the prices being charged for admission. This form of discriminatory discounting for media moguls and large corporations is filed under the SPA (Strategic Partnership Agreement) heading — which is a euphemism for 'the stronger the company, the bigger the discounts.'

To Optus' disgust, Austel chose to treat Telecom's SPA arrangements as different from Flexiplans, although the regulator did get a bit stroppy when it discovered some companies were reaping the benefits of both SPA and Flexiplan discounts piled on top. Austel took the conservative view that SPAs applied only to large customers, anyway.

Continued on page 16

Standards

ITU Revamps Standards Process

In Helsinki in early March the International Telecommunications Union (ITU) held its first World Telecommunications Standardisation Conference (WTSC). It marked the culmination of a four year reform of the ITU's standards-setting process, and was the first standardisation conference to be held under a new regime put in place at an ITU Plenipotentiary Conference in December.

That conference merged the radio standards setting responsibilities of the CCIR and the telecommunications standards activities of the CCITT into one standardisation sector.

In the four years since the ITU's last telecommunications standards-setting conference, the 1988 Melbourne CCITT Plenary, the number of CCITT standards in force (more correctly known as Recommendations) has grown a modest 20%, from 1,612 to 1,954. The amount of information involved has grown much more dramatically: from 18,500 to over 34,000 pages.

No wonder, then, that streamlining its standards-setting process has been one of the ITU's major priorities in recent years. In times past, the four yearly cycle culminating in the Plenary was adequate. Each Plenary approved standards developed in the preceding four year period, identified areas where new standards were required, created study groups to undertake this work and allocated tasks to the various study groups. Recommendations they produced only became final when approved by the next Plenary.

But the pace of technological change in the last quarter century has made this process far too slow, and an accelerated approvals procedure was developed. Under its final form, put in place at the 1988 Plenary, study groups can decide that finalisation of a particular standard is a matter of urgency. If group members are unanimous on this, the standard is circulated to all ITU member administrations and, if a majority support it, the recommendation comes into force.

Since the 1988 Plenary this procedure has worked well, but not without criticism. Some countries did not have the resources to assess all the draft recommendations presented in the time available. The Helsinki WTSC re-adopted the procedure, but gave member administrations the right to appeal to the Director of the ITU's Standardisation sector if they felt adversely affected by a particular recommendation.

Horton to Chair TSAG

Several more significant initiatives were also put in place in Helsinki. A Telecommunications Standards Advisory Group (TSAG), chaired by Austel's Technical Specialist, Bob Horton, was formed. This body will review the standardisation work program, recommend measures to foster co-operation with other standards bodies such as ETSI, and provide advice on the setting of priorities and allocation of work to better adapt the standards process to market, industry and users' requirements. It will also recommend the setting up of joint co-ordination groups when it believes these to be necessary.

These groups will co-ordinate work being carried out by different study groups within the ITU to ensure that it does not overlap or leave important matters uncovered, and will carry out similar liaison with other standards-setting bodies. Areas identified as requiring the attention of these Joint Coordination Groups were the telecommunications management network, broadband ISDN, multimedia services, quality of service and network performance.

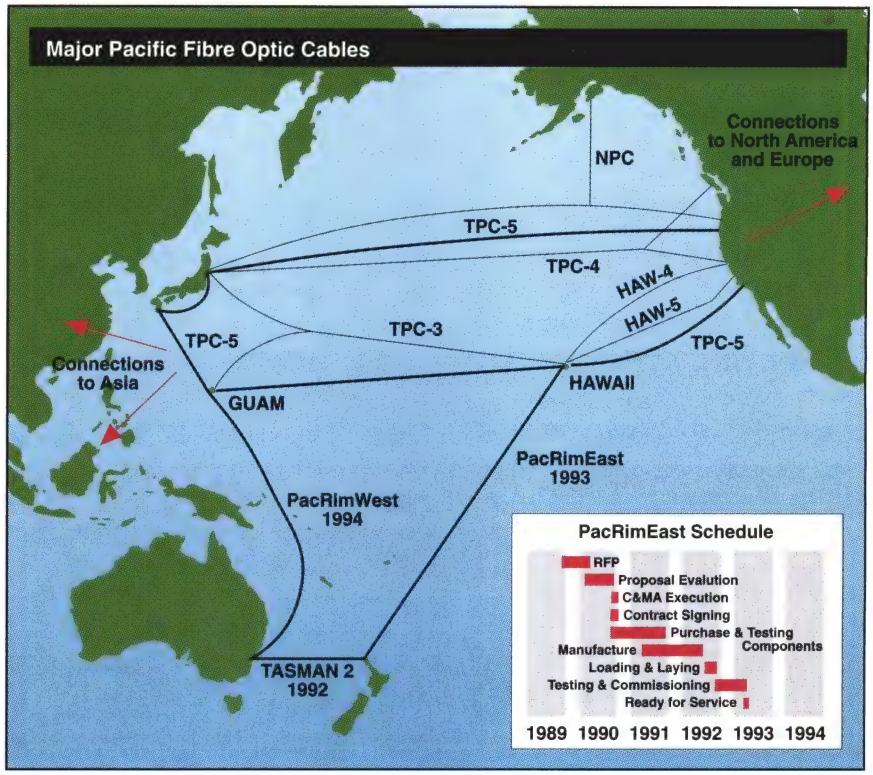
Membership of the TSAG will be open to representatives of any ITU member organisations, and Horton said he expected about 150 people to turn up when the TSAG holds its first meeting in Geneva in June. He hopes to set up a number of subcommittees to tackle specific topics. The TSAG will also work closely with the World Telecommunications Advisory Council set up by ITU Secretary General, Pekka Tarjanne, to provide high level visionary input on the future of global telecommunications.

To make the 30,000 pages of standards information more readily available to the industry, the conference also decided to step up plans for making recommendations available electronically.

Stuart Corner is the Editor of Exchange.

International Links

Capacity no Problem For PacRimEast



If you were a road engineer with the job of building a new east-west highway across the Nullarbor Plain, and you discovered that a 12-lane super highway could be built for the same price as a two-lane goat track, you'd opt for the super highway, wouldn't you? But, what if it were apparent that the road would only be used by a few tourists on bicycles? And what if you knew that a few years down the track, you'd be able to build a 24-lane or 48-lane highway with kerbs and guttering for the same price?

This is the dilemma facing submarine cable operators. The problems become apparent when you begin to dig into the design criteria of the new PacRimEast cable, opened on March 31. The new fibre optical cable joins Australia to North America (and on to Europe) via the Tasman 2 cable to New Zealand. The cable stretches 7,700km between Takapuna beach in Auckland, New Zealand and Keawaulu in Hawaii. It is the second stage of the $1.5 billion Pacific circle network which will be filled-in next year with PacRimWest linking Australia to Guam and the Hawaiian-Japanese cable network.

There are four major shareholders in PacRimEast, and about 30 minor ones. The key players are OTC and Telecom New Zealand International on this side of the Equator, and AT&T and Japan's KDD on the other. Half the cable was manufactured by the Americans (AT&T), and the other half by Alcatel TCC in Australia. On the US side there are 32 repeaters powered from Hawaii, and on the Australian side there are 28 using Kiwipower. The cable structure on our side of the join uses the same standard 6-fibre core produced by Alcatel TCC for Tasman 2, but with two of the slots filled by dummy fibres.

John Dennis, OTC's Chief Engineer on the project, is refreshingly frank about why they design cables the way that they do. I wanted to know: Why use a 6-core cable design, but only put four fibres in place? Surely the cost of the glass-fibre for another fibre-pair wouldn't be significant in the total (fibre only costs cents per metre)? Why not go the whole hog with three pair, and boost trans-Pacific capacity another 50%? In actual fact, another fibre pair in the cable would boost capacity by 100%, because only one of the two existing pairs is actually used for traffic. The other is a redundant circuit, sitting there in the dark, just in case some trawler cuts through the North Pacific cable.

Then, (when PacRimWest is in place) the ring-topology will spring into action, and the second pair will take the extra trans-Pacific load until the northern hemisphere cable is welded back together again. So what do we get for an outlay of $US270 million (shared among 36 partners) on the new cable? We get a single working pair of fibres from New Zealand to Hawaii with a capacity (to quote from the OTC booklet) of '7,560 digital channels — approx. 30,000 voice circuits.'

You've got to watch cable system statistics when carriers announce that their new cable 'will carry X-number of standard voice circuits;' this is the only business in the world where companies understate their achievements! The problem is one of embarrassment. These days they are swamped by capacity, but, like the road builder on the Nullarbor, they don't know what to do about the excess. What's more, they don't like talking about how excessive the excess is.

The reason why '7,560 digital channels' translates to 'approximately 30,000 voice circuits,' is not, as you might expect, through the use of sub-64Kbps data-rates. These fibres run at 565Mbps, so each pair is theoretically capable of handling 8,828 PCM 64Kbps channels. After removing a healthy overhead for supervision etc., this gives us our '7,560 digital channel' figure. The four-times multiplier that converts this to '30,000 voice circuits' comes from the use of DCME (Digital Circuit Multiplication Equipment). One side of any voice conversation is always listening, and there are also pauses, transmission delays and so on, which in a highly intelligent and highly multiplexed system can be accumulated and reused — so a three or four times gain in capacity from DCME is not unusual these days.

Where this is still an understatement is in the fact that no one (except for Pacific cable designers) makes much use of 64Kbps PCM for voice any more. Eighty percent of Australia's trunk traffic uses 32Kbps ADPCM, and most of the new high-capacity undersea cables (trans-Atlantic) are designed to use 16Kbps ADPCM. So at any time in the future, PacRimEast/West and Tasman 2 can be upgraded to quadruple their present capacity by simply changing the end modulation techniques. The '30,000 voice circuits' (PCM + DCME) could just as accurately have be translated as '120,000 voice circuits' (ADPCM + DCME) — and remember, we are still only talking about the use of one fibre-pair here. So it makes little sense to add a third fibre pair to the cable, even if the cost increase is only 5 or 10%. They've got Buckley's chance of using what they've already got anyway!

But what about the future? The design life of this cable is 25 years, and the mean-time-between-failures for the electronic components and lasers is now very high. Every circuit and laser in the undersea repeaters has a redundant partner. So the reliability of the system as a whole is calculated to be such that the cable should only need to be lifted for a repeater repair two or three times, at most, in its quarter century life-span.

Even with this life-span, it still doesn't pay to add any more redundant capacity through a third fibre pair in the expectation of needing it in the future. John Dennis says that the next generation of cables may run at 5Gbps and use optical amplification. So the cost of fibre and repeaters, per megabit/sec of carrying capacity, is crashing, and it only takes about two years to design and install a new cable these days.

Stewart Fist

New Zealand

Clear, TCNZ Smoke Pipe of Peace

A new mood of reconciliation has broken out between New Zealand's feuding carriers. After almost three years of bad tempered legal battles and aggressive public posturing, Telecom Corporation of New Zealand and Clear Communications look set to bury the hatchet. Meanwhile, TCNZ has signed an interconnection agreement with cellular operator BellSouth enabling the entry of a third carrier.

The catalyst for the change of mood was a three point peace proposal issued by TCNZ on March 30. The initial proposal dealt with three issues: tolls interconnection; local access interconnection; and non-code access. At present customers must dial a 050 code before being connected to Clear. Tom Burns, TCNZ Deputy Chairman, said the proposal was released to the media to counter claims that TCNZ was not cooperative. He said the offer reflects standard business practices for dealing with issues that are before the courts. As all three issues are now at the arbitration stage and Clear is an incremental user of the network, Burns says the important issues really boil down to costs.

Talking about TCNZ's proposal to provide non-code access to rival networks, Clear CEO, George Newton, told Wellington business leaders on March 31 that "if this is a sincere offer, it's acceptable." His tone implied it was anything but sincere. However, by April 7, Clear and TCNZ had reached an agreement on non-code access terms. Later that day, TCNZ amended its earlier offer to Clear on the other two issues during a scheduled meeting between the carriers.

The dispute over non-code access dates back to early 1992 when Clear's national tolls market share went past the 9% threshold. At this point TCNZ was supposed to provide non-code access under an earlier agreement.

Clear and TCNZ have a contract for non-code access, but Clear is disputing TCNZ's interpretation of the terms and conditions. At the same time, Clear does not accept TCNZ's asking price. The issue is now in arbitration.

TCNZ proposed to accept payment from Clear of the amount Clear was offering for the service while the arbitration continues. When the issue is settled, Clear will pay the difference between its offer price and the price set by the arbitrator.

From Clear's point of view, non-code access will remove the what External Relations General Manager, Neil Tuckwell, calls "leakage." He said that often customers forget to dial the 050 code when making a toll call, thus giving business to TCNZ.

At the Wellington function, Mr Newton poured scorn on TCNZ's initial local access proposal. TCNZ said it could provide direct dial input (DDI) access "for an interim period" and "on a temporary basis." Mr Newton said customers would not buy any telecommunications services on such terms.

The courts found TCNZ breached section 36 of the *Commerce Act* over this issue. Section 36 deals with anti-competitive behaviour. Clear wants to be able to buy DDI services just like any other business. Newton said TCNZ's offer was "simply a ploy to avoid the section 36 issue."

Speaking directly after Clear's reaction to the initial offer, Burns said that Newton should ask exactly what TCNZ meant by 'interim' and 'temporary.' On April 7's amended proposal, TCNZ made its position clear. It said that the short-term arrangement would have to be replaced by a long-term arrangement after Clear's legal action had gone through the Court of Appeal. However, TCNZ assured Clear that local business customers would not be interrupted by the transition from an interim to long-term agreement. Newton said Clear's Board had rejected TCNZ's initial offer on toll interconnection last December.

Burns said that the change between that offer and the March 31 offer is that Telecom asked Clear to put the financial difference between the two claims in a trust account and settle later on the basis of what the court decides. He said, "this is normal commercial practice and for Clear to reject it was tantamount to saying the company has no faith in the courts. They always could serve customers in places without POIs (points of interconnection). They chose not to because of the costs. If they want additional POIs, the rates are not the same. We have to take the cross-subsidy of the network into account."

This position was amended on April 7 with TCNZ asking Clear to pay a local call charge on each toll until the arbitrator makes a decision.

Criticising the current regulatory structure, Mr Newton said the protection offered new competitors in the market amounted to goodwill or the courts. But goodwill breaks down under commercial pressure. You are in effect saying, 'Can I play in your backyard and take away your market share?' Instead, Mr Newton says New Zealand has ended up with a legal quagmire.

Yet TCNZ's actions were designed exactly to promote some goodwill following a period of intense bitterness between the two carriers. Though less acrimonious, TCNZ's dispute with BellSouth was substantially calmed by an interconnection agreement reached on April 7.

The big question hanging over this outbreak of peace is why, and why now? A TCNZ spokesman could only answer 'why not?' He said it was time to take the initiative and get these issues solved.

Few observers of the battles in recent years are prepared to accept such a simple answer, and many possible alternative answers are circulating. Most centre on the New Zealand election, which must be held before the end of the year. At the extreme are outlandish conspiracy theories involving government Ministers and re-election funds. More plausible is the idea that the Government applied pressure on TCNZ to resolve network pricing issues in order to pave the way for electricity industry privatisation.

Perhaps the most popular theory in Wellington is that TCNZ has seen opinion polls which show the more regulatory-minded Labour Party looks like winning a solid victory. This might result in a government more willing to taking a hands-on approach to telecommunications policy. TCNZ may be betting that giving a little now is preferable than having something taken later.

TCNZ dismisses this theory. Yet, as any economist will tell you, regulators often don't actually have to regulate to achieve results — sometimes the fear of regulation alone is enough. Whatever the cause, divine inspiration, political leverage or fear of re-regulation, something concentrated minds at TCNZ wonderfully.

Bill Bennett

Litigation from page 13

So SPA bundling of local and long-line services is a different issue from Flexiplans, it says, since Optus can compete in this market. Optus, however, thought some of the SPA agreements clearly breached the Act.

Ultimately the legal advice Austel received suggested that it was possible to justify some of Telecom's more innovative schemes under section 185.2 of the Act which is headed (wouldn't you know!) 'Other terms and conditions.' What wouldn't pass scrutiny under the cost-saving definition comes in clean under the 'other' category. At this stage Austel asked for direction from Communications Minister Collins, who suggested that the carriers should be encouraged to offer Flexiplan-type pricing 'if it was of benefit to the consumer' — but not if it 'involved a reduction in competition.' He is also said to be in favour of apple pie.

And by the time Optus did go to court, Australia was in the midst of an election campaign with the general expectation that the Liberals would win. There was considerable speculation at this time about Telecom being privatised, as well, and further talk about changing the regulatory environment. Put that all together, and you've got a pretty good insight into why Optus chose the litigious approach.

Stewart Fist

PanAmSat
GOES GLOBAL

At last! A global satellite system designed expressly for the world's video industry... the PanAmSat global satellite system. PanAmSat will cover the world for all your communications needs... domestic and international video, voice and data into dishes as small as 90 cm. The new Hughes HS 601 PanAmSat satellites will be the most advanced and highest powered international satellites in the sky. Start making plans now to get on-board PanAmSat to cover the world.

SATELLITE	COVERAGE	LAUNCH DAT
PAS-2	Pacific Ocean Region	Spring 1994
PAS-3	Atlantic Ocean Region	Winter 1994/95
PAS-4	Indian Ocean Region	Spring 1995

PanAmSat
Free Enterprise in Space

TRUTH AND TECHNOLOGY
WILL TRIUMPH OVER
BULLSHIT AND BUREAUCRA

Spectrum Management

SMA Already Under Fire

Just two months before it opens its doors for business on July 1, the Spectrum Management Agency (SMA) is already facing more questions than it has ready answers for. Heading the list of groups with a grouch is the Australian Electrical and Electronic Manufacturers' Association (AEEMA) with the backing of AOTC and Optus and a chorus of other radio communications equipment and service providers.

In hiving off its radio communications division to form the SMA, the Department of Transport and Communications is compelled by the *Radiocommunications Act*. But the legislative blueprint for the SMA is perceived as being somewhat flawed, in that it fails to specifically address some critical technical and economic issues. The general feeling is that what the legislation doesn't contain is almost more significant than what it does contain. And by that, the aggrieved mean too few guidelines on such issues as how interference disputes will be handled. Just as important is the question of how much spectrum will be left for AOTC, Optus and Vodafone to meet their universal service obligations and to develop future services driven by new technologies and standards.

At the core of the issue is a fear that the SMA may not be able to effectively regulate entrepreneurs and commodity speculators who may be tempted to buy up spectrum and hoard it, then use that power to increase the price. In a primarily money/power, cost/control issue, the big spectrum licence incumbents could possibly be perceived as fighting to preserve their status quo, while the Government sets about cashing in on a limited and valuable resource and streamlining its administration.

AEEMA's Executive Director, Alex Gosman, says there are too many 'what ifs?' in the implementation of the radiocommunications legislation and Ministerial Directions and more consultation is urgently needed. "DOTAC talks about 'administrative efficiencies,' but this is pure Canberra-speak that could cover a multitude of things," Gosman says. AEEMA's concerns are expounded at length in a submission to DOTAC's First Assistant Secretary, Radiocommunications Division, Roger Smith, who agrees DOTAC and industry need to sit down and thrash things out.

Inadequate Legislation

AEEMA's submission points out that while the industry body supported the goals of achieving more efficient disposal and administration of spectrum, there is now 'considerable disquiet in the manufacturing and distribution industries that the finer points on the technology side have been overlooked.'

"Also, if cost savings are made by the SMA, do these savings go to public consolidated revenues, or to the industry? I understand DOTAC earns around $70 million per year from the sale of spectrum, which is three times its administrative costs. From AEEMA's viewpoint, the kinds of benefits that might flow to industry would be quicker allocation of spectrum and speedier response to industry needs," Gosman says.

Another of AEEMA's concerns is the huge potential cost of interference disputes if they lead to litigation. Also, if spectrum buyers abuse their power to force up the price, action under the *Trade Practices Act* would be expensive and time-consuming.

Gosman suggests specific technical issues could be addressed and resolved by preparing a series of hypothetical interference scenarios involving compliant equipment and working through them with technical experts from DOTAC.

Gosman says this could be achieved if DOTAC agreed to second some of its laboratory staff to a yet-to-be-formed technical subcommittee of the Radiocommunications Consultative Council, whose core members include defence representatives, telecommunications and television and radio industry associations, user groups and unions. "A technical subcommittee could help the SMA get it right before it even begins selling spectrum," Gosman says.

AOTC is concerned that "the *Radiocommunications Act* gives no specific policy guidance to the SMA on the linkage between telecommunications and radiocommunications, as is done for linkage between broadcasting and radio communications. We believe that special policy consideration is needed to provide radio spectrum for telecommunications services provided by carriers licensed under the *Telecommunications Act*," says AOTC General Manager, Network Strategy, Dr Peter Gerrand.

"Telecom believes that the SMA should take into account the Government's telecommunications policy objectives in the development of spectrum for future telecommunications services, and that this may lead to a different approach than the SMA would use for other radio-based services. There needs to be a clear division of responsibility between Austel and the SMA for matters such as the planning for future radio-based telecommunications services. By the turn of the century, the majority of calls will have some radio component," he said.

Bernard Levy


Is the sky the limit? Not with MCI. MCI's global networking capabilities extend far beyond that—into satellite, undersea fiber and digital microwave technologies. This creates one of the world's most advanced systems for transmitting voice, data, video and imaging signals: we call it MCI's Global Highway. MCI can also custom design Private Network Service to your company's specific requirements—ensuring you international connections of the highest quality, as we and our subsidiaries have done for the past 70 years.
Visit the MCI booth, (#510, Hall 5) at ATUG '93, or call (02) 983-9788.
MCI
©MCI International, Inc., 1993. MCI, its logo, and all other MCI products and services mentioned herein, are proprietary marks of MCI Communications.

Mobile Communications

Mobile Data Takes to the Air

All of a sudden, everybody seems to be getting into mobile or wireless data services. In the same week in early March, BellSouth announced plans to launch its Mobitex mobile data service in Australia; from the US came a story that Sun Microsystems had teamed up with a Russian company with radio expertise in order to get into the wireless local area network market and IBM became the first commercial partner in the CSIRO's bid to take a world lead in wireless local area networking. The following week the NSW Government announced that Telecom and Motorola had won a contract to provide trunked mobile radio services to 20,000 government users. Data communications is expected to be a large component of the future network's usage.

A dedicated mobile data network is new to Australia, but they have been operating for several years in the UK. BellSouth, operating through its wholly-owned subsidiary BellSouth Mobile Data Australia Pty Ltd, will invest a total of $120 million to cover all capital cities with its network by 1996.

BellSouth entered the mobile data business in 1990 in the US when it set up a joint venture with Ram Broadcast Corporation, Ram Mobile Data. The frequencies being used for the Ericsson-developed Mobitex service in Australia were originally reserved by Ram. BellSouth and Ram are now involved in Mobitex networks in about 10 countries. Since the announcement of the Australian system BellSouth has announced plans for a Mobitex network in France in a joint venture with France Telecom.

Mobile data is clearly big business. It is being driven not only by new applications for traditional users of mobile communications services such as emergency services, couriers etc., but by the growing use of portable personal computers. Local area network sales are growing at about 20% annually and some estimates suggest that by the end of the decade 80% of all personal computers sold will be portable models. The next step is clearly portable networking.

It might appear at first sight that the markets for wireless local area networks and mobile data services are quite distinct: wireless LANs for in-building communications and mobile data for those on the move over a wide area. Not so. One application which BellSouth Mobile Data has identified for its service is within airport terminals: the fixed check-in terminal can be replaced with a mobile terminal and ticket printer connected to the airline's computer over the Mobitex network allowing check-in operators to move along a queue greatly reducing check-in times.

BellSouth won't say that whether it has any airlines in Australia planning to implement this application, but its network rollout will provide coverage of Australia's main airports as its first priority. Service is expected to commence in June, with a full network rollout to major capital cities and regional areas within two years. The service will be tariffed on packets transmitted, not connect time or distance.

Mobitex will transmit data only at relatively low rates of up to 4,800bps, but the aim of wireless LAN technology is to match the throughput of fixed networks such as FDDI at 100Mbps. In wireless technology there is a fundamental limit to the amount of information that can be carried at a given frequency: the only way to achieve throughput approaching these rates is to operate at very high carrier frequencies.

The CSIRO-IBM partnership will aim at technology operating at 60 GHz, the very limit of radio technology. There are infrared systems on the market, but they rely on simple on/off switching of the infrared signal to convey information. The CSIRO's technology modulates the 60 GHz signal in a similar fashion to the way information is modulated onto a carrier in any other radio communications systems. Similar modulation of infrared signals is some years away.

The CSIRO said in 1992 that it had been able to demonstrate communications at 200Mbps at 40 GHz. Its initial plans to commercialise the technology in collaboration with IBM will aim for a much more modest throughput of 10Mbps. The project will use technology from IBM whose own wireless LAN product, Samba, with a data rate of 1Mbps, was launched last year.

Stuart Corner is the Editor of Exchange.

Standards

Telcos Get into the Standards SPIRIT

Telecommunications carriers from around the world have joined forces to try and convince computer makers to develop a computing platform just for their industry. The carriers — all of which are members of the Network Management Forum (NMF) user association — have formed SPIRIT (service providers integrated requirement for information technology) in an effort to develop a specification for an 'open' computing platform that will make it easier and cheaper for them to buy and use hardware and software.

SPIRIT participants include AT&T, Bell Communication Research, BT, France Telecom, Italy's Stet, Japan's NTT and Telefonica. Several hardware manufacturers have also joined including DEC, Hewlett-Packard, and IBM. According to NMF officials, other carriers and computer vendors have also expressed interest in joining.

"We are getting together to do this because there has been a major shift in the industry where the vendors are no longer dictating what the user can buy . . . rather it is the users getting together and saying 'this is what we need'," said John Wright, Chairman of the SPIRIT steering committee and an executive at BT. "While there is tremendous competition within the communication industry, we believe that each of the carriers have more in common than differences. I think because of the commercial pressure that all of the carriers are feeling right now, we will be able to find a common ground and create a set of specifications that will save us all a lot of money."

Telcos typically create customised network management platforms because their networks are so vast and virtually everything that carriers use network management for — from billing to the provisioning of services — has been built and managed internally. However, because of the in-house development, most carriers have different specifications and platforms which makes it difficult for computer vendors to develop consistent hardware and software.

In an effort to find a solution, SPIRIT officials said that the specifications being worked on will include common applications platforms and existing specifications — such as the NMF's OMNIPoint. The consortium plans to build specifications for both hardware and software development platforms as the basis for telecommunication network management, service management, operations support and generalised business management systems.

The platform SPIRIT is hoping to design would hide systems software complexity from application developers, which would allow them to concentrate on developing application functionality rather than integrating incompatible systems.

The new specification will also allow carriers to transparently connect systems across operating platforms and provide independence for the underlying technology, thus enabling technology innovations while preserving application investments. In order to achieve some of these goals, SPIRIT officials said that the platform will include specifications for programming and database access languages, communication protocols, user interface, and APIs.

Not only are carriers hoping to find a solution that will save them money, but computer vendors are also hopeful that they will be able to support the specifications and thus open up doors that in the past had been shut

AT&T SYSTIMAX Premises Distribution System.

It connects everything you can imagine. Even things you can't.

Imagine a wiring system that connects all the different systems that exist in today's buildings. Now imagine it can also connect systems that don't even exist. Yet. That's AT&T SYSTIMAX™ PDS. It allows you to integrate equipment from vendors as diverse as DEC, IBM and HP. It even allows technologies like ISDN and FDDI to work together. Seamlessly. Transparently.

AT&T SYSTIMAX PDS is an advanced, modular, building wiring system with an open architecture that combines both copper and optical fibre with a 5/15 year assurance programme. With SYSTIMAX PDS, you're ready for everything you can imagine. And a lot of things you can't. No other system offers you greater flexibility. SYSTIMAX PDS. Call AT&T Network Systems at 008 804 738.

AT&T
Network Systems

ATT 3008. FPC

because the carriers had built a lot of their systems in-house.

"We really think that there may be some different benefits to SPIRIT and we are going to work with them to help find a common set of specifications that we can support and provide," said Bill Gassmane, a DEC spokesman. "A lot of the problems that the telecom companies are facing are the same as the ones that large corporations are dealing with. Because of this some of the expertise that we have learned will help the carriers find solutions."

While the consortia has just started, according to SPIRIT chairman, Wright, it has agreed on a number of different steps that need to be taken before a set of specifications will be available. First, SPIRIT will try to define what specifications are important and which should not be included. Wright believes that by doing that SPIRIT will quickly find common ground that all carriers can agree upon.

The consortia will also look at distributed computing systems, such as DCE (Distributed Computing Environment) and other distributed systems. Wright said that this will accelerate the development of standards that are just now starting to make their way into the market.

While SPIRIT has not even held its first meeting, Wright said that he believes that all of the work that is being planned should be completed within two years. At which point he said SPIRIT will dissolve. He added that one of the main reasons why SPIRIT will not continue for a long period is that there are already enough consortia in the industry to set standards. SPIRIT however, he said will not be setting standards but will solidify industry-wide agreement for implementing proposed and defined specifications.

Mike Moeller

Internetworking

What's the Cisco Secret?

Why is it that while most of the IT industry wallows in recession networking companies like SynOptics, 3Com, Cabletron and Cisco Systems are booming? Take Cisco, in the 1990/91 financial year the router vendor reported $US183 million in net sales and posted $US43 million in net income; less than three years later the company has posted $US145 million net sales and $US38 million net income for the second *quarter* ended January 24, 1993.

So what's the secret? While not wanting to give too much away, Cisco President, John Morgridge, says it's all about strategy, capitalising on opportunities and staying focused. "There were a number of people in the router market the same time we were [so] we didn't create the opportunity but we clearly capitalised on it. We didn't have to create the market. A lot of companies try to create markets, but that's a very hard way to grow a company. The point is that we have done a number of things correctly. One is that we stayed focused and some people who have not done well in this market broke that focus."

In Australia last month for the inaugural Australasian Cisco Users Conference, Morgridge says that the internetworking market is now on the verge of a shakeout similar to those which have occurred in other sectors of the IT industry. Using the PC industry as an example, he says only a few vendors will survive, and those survivors will be companies that expand their focus but don't go into new markets.

With his track record, who could argue? After joining Cisco October 1988, Morgridge charted a course for the fledgling company which has taken it to the dominant position in the internetworking business. Cisco may not have actually created the booming router business, but under his stewardship the company has certainly been the catalyst for its growth.

"We were the first to deliver a multi-protocol router [and] the first to allow construction of very large networks," he claims.

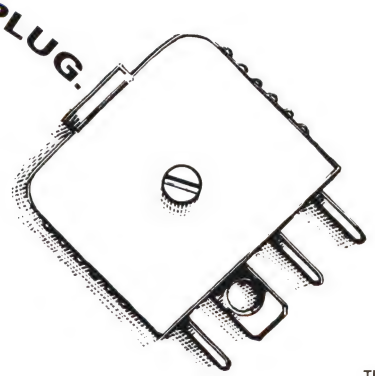
Right from the start, Cisco had "a good manufacturing strategy, we did not build an integrated manufacturing capability. From Day One we were willing to partner, we actively went out and solicited Cabletron, Chipcom, SynOptics and built products for them. Has there been a lot of dollars [in that]? Not a lot of dollars, but there's been a lot of market position because it helped establish us as the de facto standard in the industry." Cisco also carefully invested in promotion. "From Day One we've dominated Interop. We've called it our show."

Also important in establishing de facto standard status was penetration of the university market. But unlike other companies which donate products to academia, Morgridge says that Cisco sells them. It's "more a case of being an active partner than being a donor. You have to be there with support, you don't just give it to them. If you work with them and ensure that they're successful with it then they'll be true believers." And it's an ongoing strategy. "Right now we are focused on ensuring that the South American universities use our products."

How does he rate his progress? "When they hired me the chairman said 'this is a good opportunity, don't screw it up,' and he recently observed that perhaps we hadn't."

Mark Smeaton

AFTER LAYING ONE OF THE WORLD'S LONGEST FIBRE OPTIC NETWORKS, WE THOUGHT WE'D GIVE IT A PLUG.



Telecom AUSTRALIA

TEL 0377

Germany

Germany's Long Journey to Telecom Reform

Germany is in the midst of a long trek to liberalise its telecommunications industry. It has already taken some major steps, including the partial dismantling of its public network monopoly, the opening of equipment markets to competition, the lifting of key restrictions on the use of private networks, and the initiation of vendor licensing for value-added services, satellite networks, and mobile telephony. And the German PTT, Deutsche Bundespost Telekom, has picked up the pace in recent months by overhauling its leased line services, bolstering efforts to offer outsourcing services, and launching sweeping organisational changes aimed at dispelling its reputation as one of Europe's more unhelpful and expensive PTTs.

The ramifications of Telekom's monopoly status for user costs are evident in Germany's leased line rates, which are typically two to three times higher than equivalent prices in the UK. Prior to last year, the only leased lines available in Germany were DDV lines, which come complete with modems at both ends of the link and automatic backup service that enables traffic to be rerouted around any line failures. The problem with the DDV service is that high bandwidth lines are too expensive.

Forced to Change

Two developments forced Telekom to abandon its DDV-only policy and begin offering ordinary leased lines. One was the implementation of a European directive requiring PTTs to offer such lines. The other was the German Government's licensing of an alternative mobile telephony network operator, Mannesmann Mobilfunk GmbH. Mannesmann contended that it couldn't compete with Telekom unless the PTT lowered its leased line charges.

In addition to offering ordinary leased lines the PTT made some radical changes to its DDV pricing structure. Telekom was forced to change its pricing to maintain a reasonable price differential between DDV service and its new monopoly leased lines — particularly since DDV lines are now resold by Telekom's VAN operators.

Users expecting meaningful reductions in DDV charges were disappointed — and outraged. Telekom did institute significant rate cuts for long distance DDV lines, but it balanced those cuts with steep increases for short haul lines — the kind of lines used by most DDV customers. Originally, Telekom more than doubled some short haul charges, but after an outcry from users it limited hikes to a maximum of 50%.

The arrival of ordinary leased line service was one of two developments almost certain to boost interest in private networks. Early this year, the German Government lifted restrictions that barred the switching of voice traffic from outside parties own private nets.

Observers say the two moves will encourage the development of national private networks based on 2Mbps leased lines. Corporations that previously were not allowed to carry traffic from subsidiaries on their private networks are likely to take a renewed interest in leased line nets. Other networks are now being built by VAN operators as they gear up to compete with Telekom.

Telekom's high leased line charges also are jeopardising one of its pet projects: the deployment of 802.6 metropolitan area networks (MANs). The carrier has gone further than most other European PTTs in trialling MAN technology, operating extensive pilots in Stuttgart and Munich.

But while MANs may be getting star treatment, Telekom may be killing interest in its planned Datex-M commercial service by proposing very high charges for it. Under Telekom's proposal, customers will have to pay for their own access lines at the same rates as monopoly leased lines, and then pay additional charges for using Datex-M. Even enthusiastic users say they may have to keep away from Datex-M, which is scheduled to become commercially available next year, at the conclusion of the PTT's MAN pilot projects. Telekom does acknowledge that its high prices are sapping interest in commercial MAN services. "We have a little bit of a problem finding users for the service," admits Herbert Gerber, Telekom's Datex-M Project Leader.

At the same time, however, the PTT insists that its price cutting options are limited. Telekom claims that of last year's revenues of DM52 billion ($45 billion), DM30 billion ($26 billion) went to cover investment costs that can't be reduced. These costs include interest charges on past investments, the deployment of new technologies like synchronous transmission, and the construction of new network infrastructure in the former East Germany. The latter alone cost DM11 billion ($9.6 billion) last year, Telekom says. A trunk network is now in place throughout the eastern region, and telephone lines to more than a million new customers have been installed in the past two years.

Telekom says its status as a government utility also restricts its ability to cut costs. Its profits — estimated at about DM5 billion ($4.39 billion) last year — are channelled to state coffers. Telekom also says it has little control over its high personnel costs because staffers are public servants with guaranteed jobs for life. Telekom is also required by law to subsidise money-losing banking and post operations of its sister companies. Last year, those operations drained DM2 billion ($1.75 billion) from the PTT.

Getting in Shape

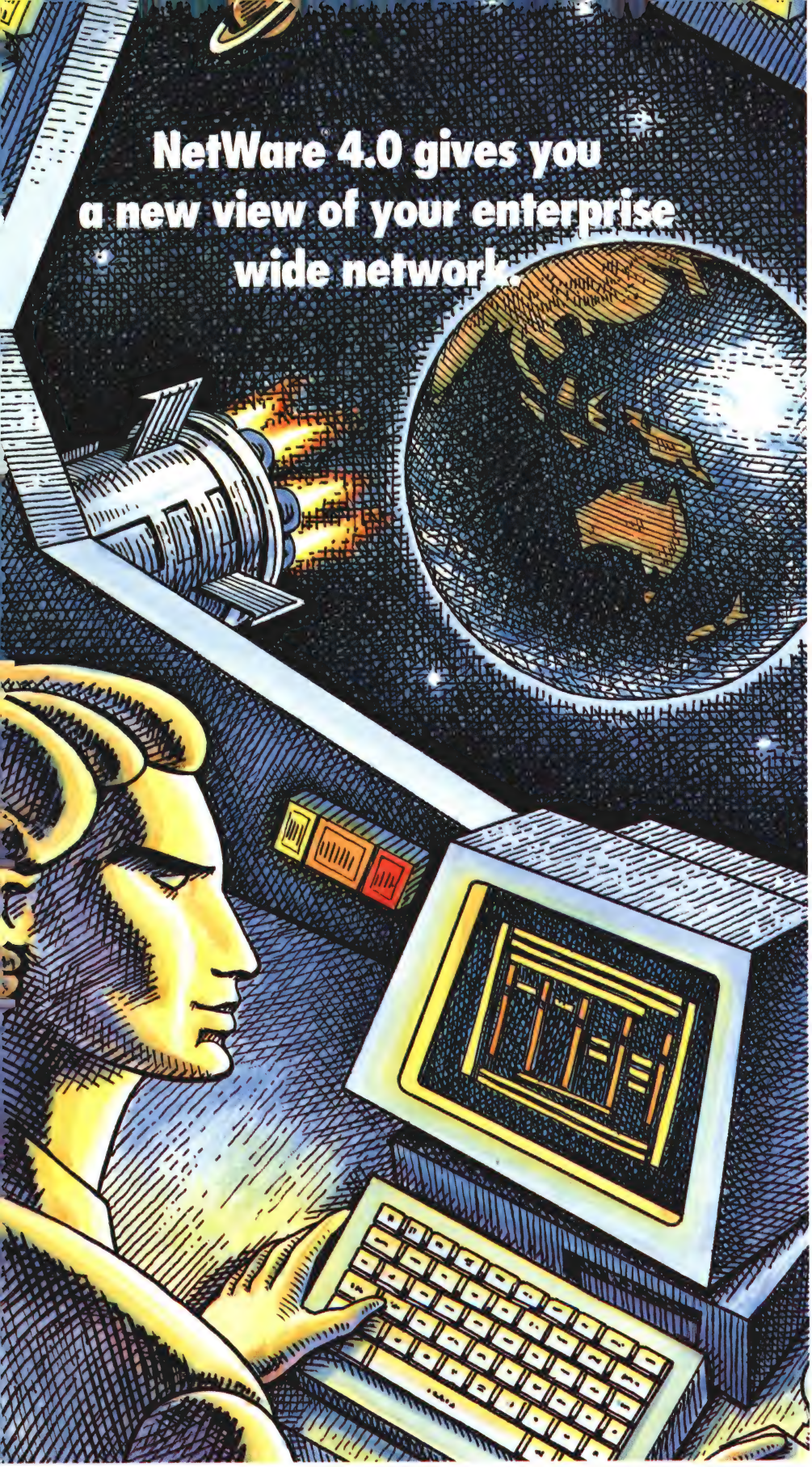
But Telekom's tales of woe aren't winning much sympathy from users. Critics note than even before Germany's unification, the PTT was investing nearly half its revenues in capital equipment, compared with the 25 to 27% investment levels of other PTTs. Even Telekom admits that its extra investments have not resulted in demonstrably better services.

To improve its efforts to meet customer needs, Telekom is following the example of British Telecommunications Plc and is reorganising its marketing arm into four new departments focusing on different types of cus-

The High Cost of Germany's Leased Lines

	GERMANY (DDV LINES)	GERMANY (ORDINARY LINES)	FRANCE	UNITED KINGDOM
ANALOGUE				
2km	$US279	$US149	$US138	$US71
50km	1,345	805	785	253
200km	1,979	1,424	1,471	495
64KBPS DIGITAL				
2km	$US502	$US383	$US423	$US272
50km	3,494	1,767	1,646	490
200km	4,929	2,247	2,304	621
2MBPS DIGITAL				
2km	$US4,110	$US2,545	$US1,150	$US832
50km	19,425	9,591	6,712	2,172
200km	$35,679	17,641	14,751	5,526

Prices are monthly fees. Analogue DDV charges include 9.6Kbps modems. Prices for Germany do not reflect lower cost 'local service' options available for lines entirely within city limits.
SOURCE: Tarifica from Intelidata Ltd. (London)



NetWare® 4.0

The global network

NOVELL®

Novell NetWare *4.0* is the first product from Novell to be able to give you a truly global view of your enterprise wide network, making administration and management of the network simpler and more efficient.

NetWare 4.0 seamlessly combines all the elements of your network into one cohesive unit, providing an integrated view of the entire network right at your fingertips.

NetWare 4.0 Delivers unequalled levels of flexibility and robustness with distributed, replicated directory services.

NetWare Directory Services maintains names and information about every user, group, printer, volume, and any other service found on the network. This simplifies the task of searching through the network to find the resources you need.

True single-point administration is made possible because of the global view provided by NetWare Directory Services, and the automatic distribution and replication of their information across all file servers.

NetWare 4.0 is backed by the extensive technical resources of Com Tech - Australia's leading Open Systems distributor - who provide the expertise required to correctly structure your NetWare 4.0 network before installation.

So, if you want to simplify your enterprise wide network administration, take a global view with NetWare 4.0.

For Details of your nearest authorised reseller please phone Com Tech on:
NSW (02) 317 3088 or (008) 263 954,
VIC (03) 696 0770, ACT (06) 257 7695,
QLD (07) 369 8800, SA (08) 233 5882,
WA (09) 322 5605.

Please rush me more information on :

- ☐ **Novell NetWare 4.0**
- ☐ **Authorised Novell Training Courses**

Name:_____

Title:_____

Phone:_____

Fax:_____

Company:_____

Address:_____

_____ Post Code _____

Send to: Com Tech Communications,
PO Box 207, Alexandria, NSW 2015
or Fax to (02) 693 5917.

MIS

COM TECH

Smith Ross & Muir CT3327 MIS

tomers. The PTT initiated the program, called Telekom Contact, at its Bonn headquarters this past January; it plans to extend the program to its regional offices next year. One of the new departments targets large corporations needing tailor made solutions and intensive support. A second department handles small and medium sized companies requiring off the shelf products and services. A third department deals with Telekom's 28.5 million residential customers, and a fourth provides mobile telephony services.

A Private Future?

Telekom Contact also is part of a long range plan to facilitate the possible fragmentation and privatisation of Telekom. The first elements that are likely to go are departments handling large corporate accounts and mobile telephony. They could be sold in the next two to three years, according to a Telekom spokesperson.

Although restructuring could help Telekom become more efficient and responsive to customers, competition is the surest way to drive down prices.

German users already have seen the effect of competition on prices in the market for very small aperture terminal (VSAT) satellite services. The German Government opened the VSAT market to competition at the beginning of Germany's 1990 reunification to give companies a way to extend their networks quickly into the eastern states. Telekom was the first to offer a VSAT service, but private operators such as ANT Nachrichtentechnik GmbH, Teleport Europe GmbH and Spaceline Communication Services GmbH soon followed. As a result of the competition, the cost of a typical VSAT link in Germany plunged by 50 to 70%.

Germany's decision to open up the VSAT market has positioned the country as a communications gateway to eastern Europe. Now that the terrestrial infrastructure is getting established in eastern Germany, users want VSAT operators to establish links in Poland, Slovakia, and Hungary. Many German VSAT operators have reached agreements with PTTs in those countries.

At home, Telekom is bracing for more aggressive competition from VANs — a development that bodes well for users. Before ordinary leased lines became available, independent VANs struggled to make ends meet by providing virtual private networks to corporate customers. For its part, Telekom concentrated on delivering plain packet switching services.

But with the shakeup of Telekom's leased line service, VAN operators can now build networks using monopoly leased lines instead of renting the over-priced DDV lines and trying to add extra value. The lifting of restrictions on switching third party voice traffic also means VANs can target all aspects of corporate communications.

The hard experience gained by private VAN operators in offering virtual private networks is turning to their advantage in one burgeoning market; outsourcing. Many of Germany's VAN operators have struck alliances with international operators to deliver cross-border coverage. Germany's two largest independent VAN operators, Debis Network Services GmbH and International Network Applications Services GmbH are installing LANs as well as WANs.

Telekom hopes to capture a major part of Germany's outsourcing market as well. It is beefing up a service called Telekom Datennetz, which for the past two years has been offering one stop shopping and billing for private data networks. The revamped offering, called Telekom Designed Networks (TDN), will offer voice as well as data virtual circuits. Telekom also expects to roll out its big international outsourcing guns at the end of this year, when the pan-European network being built by Eunetcom, its joint venture with France Telecom, is scheduled to start carrying traffic.

Peter Heywood and Elke Gronert

Here's How Our Token Ring Products Stack Up To The Competition's.

Stack us up to any other major hub vendor, and see for yourself. Cabletron offers more Token Ring modules for the intelligent hub than the competition. Period.

But that's only the beginning.

Our Token Ring products are driven by Intel's high-performance i960 32-bit RISC processor. The competition's? 16 bits. Our active Token Ring modules provide up to 24 ports. The other guy's? Half that. And we have an integrated solution for bridging Ethernet, Token Ring and Wide Area Networks with a single module. Their solution? A stand-alone box.

Our products use Flash EEPROM for easy upgradeability. Theirs don't. Our Desktop Network Interface Cards support both STP and UTP and provide *at-a-glance* diagnostics. Theirs won't. And we've integrated twelve station ports on a single, manageable repeater module with Ring-In/Ring-Out capabilities for both fiber and copper. They can't.

With 19 modules for our MMAC hub, Cabletron's Token Ring solution is "the complete solution." Theirs? Well, they simply don't stack up.

For more information on Cabletron's Complete Token Ring Solution, give us a call at (603) 332-9400, Ext. 2705. And ask for your free copy of Cabletron's *SNA and Token Ring Integration Strategy*, the white paper that maps out a smooth migration to the "new" SNA and integrated SNA/Token Ring environments.

"To support new services to our subscribers, we at Blue Cross Blue Shield of Connecticut have embarked on an expansion project that will take us from 250 workstations to almost 2000! We found that Cabletron had the most complete line of Token Ring products and the technical support to assist us in designing and implementing the network that was right for us."

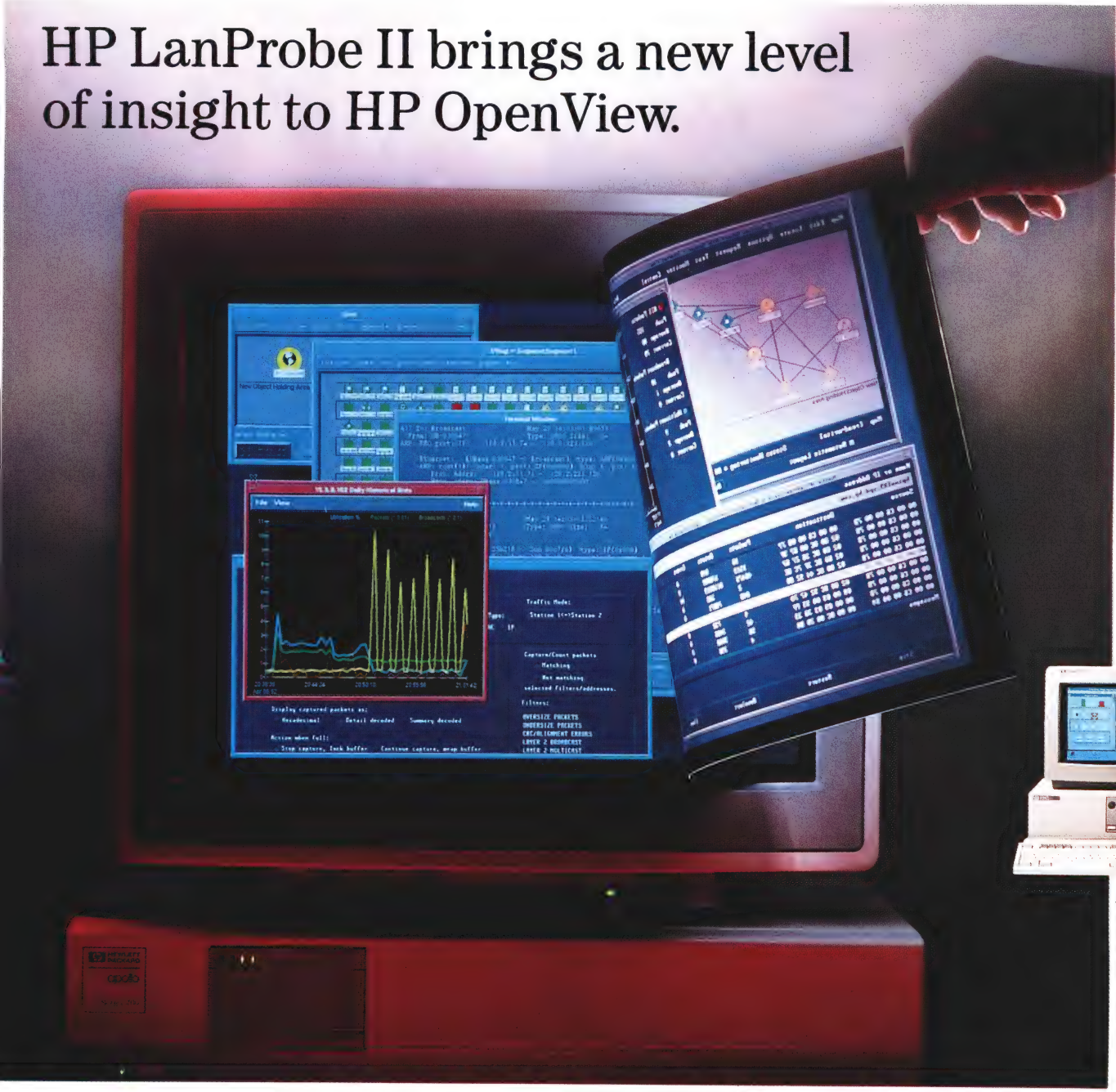
Graham Morrison
Network Design & Engineering
Blue Cross Blue Shield

CABLETRON SYSTEMS Inc.

The Complete Token Ring Networking Solution™

Corporate Headquarters 35 Industrial Way, P.O. Box 5005, Rochester, NH 03867-0505

HP LanProbe II brings a new level of insight to HP OpenView.



HP LanProbe II can be managed from either an HP-UX OpenView workstation or a Microsoft® Windows™ PC.

Use HP LanProbe II with the HP OpenView Probe Manager, and manage faults more effectively.

HP LanProbe II is a second-generation Ethernet LAN monitor that spots and diagnoses network problems quickly. Using HP's newest OpenView application, HP Probe Manager, you can access the power of HP LanProbe II from an OpenView HP-UX workstation and get the most comprehensive network management from a single source.

HP LanProbe II supports RMON-MIB,* the accepted standard for SNMP network monitoring. So you can monitor all the nodes on your network - even if they come from different vendors - using the largest variety of management tools.

These tools include current statistics for fault management, and long-term trend graphing for performance tuning and network planning. Plus, you get remote packet capture and decoding for protocols such as TCP/IP, Novell, NetWare, Banyan VINES, DECnet, AppleTalk, OSI, 3COM, and XNS to help you locate problems fast and take corrective action directly.

And since HP LanProbe II complies with RMON MIB and other industry standards, your investment in probes and applications is protected.

So, if you'd like more insight into the performance of your network, call our customer information centre on 008 033 821 or Melbourne 272 2555 and we'll send you a data sheet that explains how HP LanProbe II helps you take network management to a new level.

*Remote Network Monitoring Management Information Base.

A Better Way.

HEWLETT PACKARD

The ATM Circus Gets a Ringmaster

The ATM Forum is acting both as coordinator and catalyst for asynchronous transfer mode standards.

Every three-ring circus needs a ringmaster to keep the elephants from trampling the dog acts and the sword swallower from having an unfortunate accident with the knife thrower. With several organisations now scrambling to define all types of standards for asynchronous transfer mode (ATM) networks, it makes sense to have a way to sort through their work to keep ATM moving in the right general direction. For now, the job of co-ordinating acts under the ATM big top belongs to the ATM Forum.

The vendor consortium is doing more than monitoring would-be ATM standards — it is also taking a lead role in formulating key specifications that standards bodies like CCITT and ANSI have been slow to address. These specs, many of which govern the interfaces that will enable users to piece together their own ATM networks, should start coming out in earnest this June.

The ATM Forum's main goal is to identify a subset of CCITT and ANSI standards that vendors will agree to implement, says Glenn Estes, who chairs the ATM Forum's technical committee. The consortium wants to avoid the kinds of problems that have plagued ISDN, where the existence of too many standards led to the development of compliant products that still failed to interoperate.

But when standards bodies fall short of ironing out the specs needed to set up ATM networks, the ATM Forum is taking the initiative and coming up with its own recommendations. Projects now being tackled by the consortium include adding a multicasting provision to the CCITT's ATM signalling recommendations and creating entirely new specifications, such as the data exchange interface (DXI) between routers and data service units (see figure). The Forum says it will submit any specs it develops to the appropriate standards bodies for official approval.

In fact, much of the ATM standards work scheduled to be completed in the next few months will come from the ATM Forum. In June, the group expects to deliver a set of documents covering such issues as signalling, traffic management, interfaces between public ATM networks, and support of services such as frame relay and SMDS over ATM. Last month, the Forum was set to announce plans to develop specifications for network management, interoperability, and support for ATM over unshielded twisted-pair wiring.

Watching the CCITT

The basic set of ATM standards, covering protocols and interfaces, was drafted by the CCITT in 1990 and updated last year. These specifications define ATM's standard 53-byte cell size and structure, the user-to-network interface (UNI), and the physical layer and data rates over which the cells would be transmitted — 155Mbps or 622Mbps SDH/Sonet (Synchronous Digital Hierarchy/Synchronous Optical Network) links.

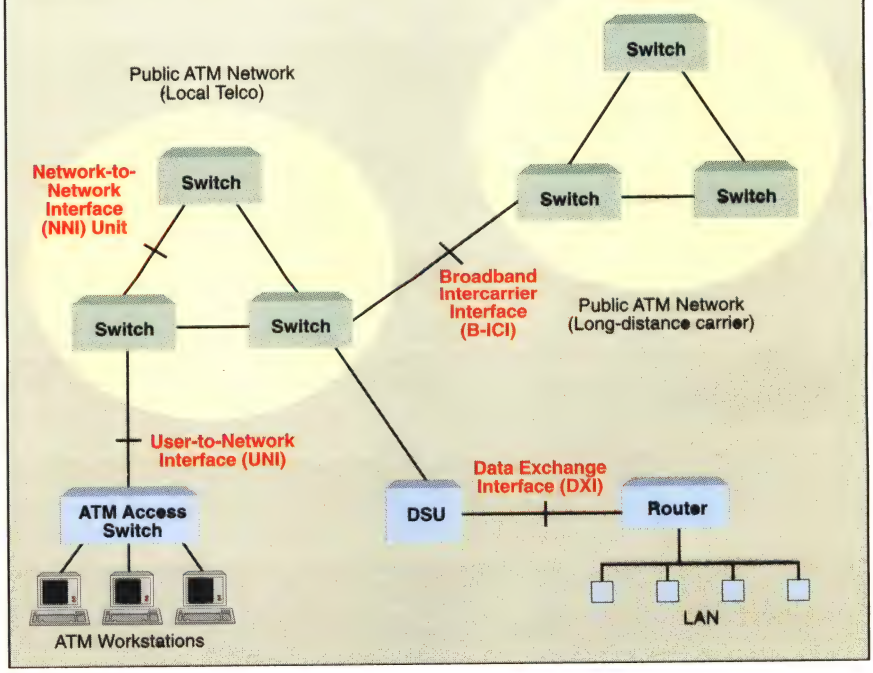
The CCITT is now working on an additional set of five standards, known as ATM adaptation layer (AAL) protocols, to define different services over ATM. AAL Type 1 defines a connection-oriented service with a constant bit rate, such as a T1 or E1 link. A matching ANSI document defines precisely how a US T1 (1.54Mbps) stream would be mapped onto an AAL Type 1 connection. AAL Type 2 covers clocked services with variable bit rates. AAL Types 3 and 4 define connectionless services with variable bit rates, such as Switched Multimegabit Data Service (SMDS) offerings. Type 5 covers data transport of LAN and LAN-like traffic. CCITT recommendations on AAL Types 1 to 4 were expected to be approved at a recent General Plenary Assembly; Type 5 is expected to be approved in July.

The CCITT has also developed a draft document, called Q.93B, that governs asynchronous transfer mode network signalling on point-to-point links. Q.93B is expected to be finalised by year's end.

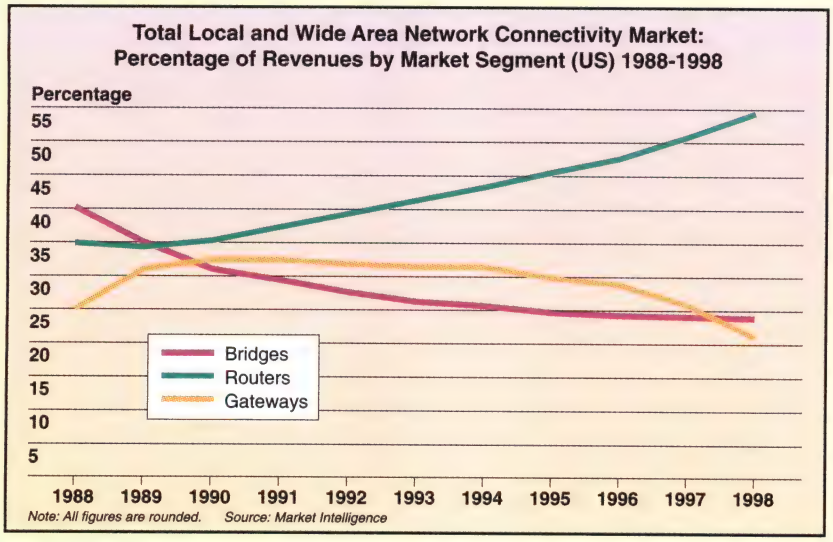
The ATM Forum has taken it upon itself to keep a close watch on the CCITT's efforts. One of the first tasks undertaken by the

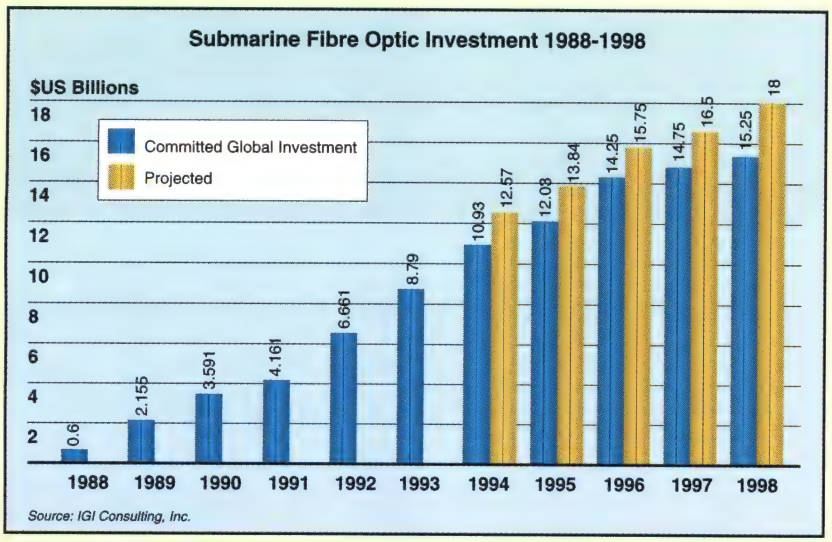
ATM Interface Pressure Points

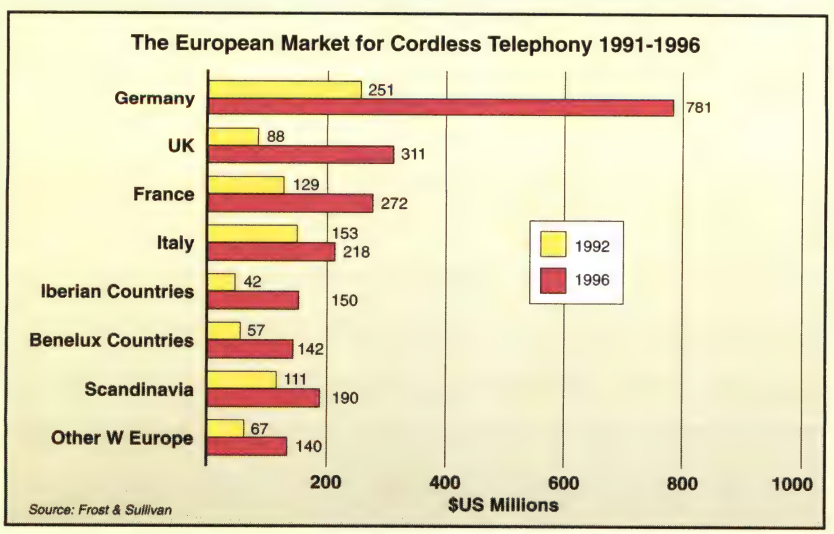
Of the four interfaces most critical to the development of standard ATM networks, work is furthest along on UNI. The ATM Forum expects to complete work on DXI and key portions of B-ICI this June, but work has yet to begin on NNI, which will govern interoperability of ATM switches.



Market Watch







Forum, which was founded in January 1992, was to develop an enhanced version of the CCITT's UNI spec.

The Forum's version, called UNI version 2.0, was published in June 1992; in addition to the Sonet interfaces, it defines 45Mbps DS-3, 100Mbps fibre, and 150Mbps fibre interfaces. In addition, ATM Forum enhancements to the CCITT's Q.93B signalling spec may be included in the final version of that standard.

Last year, the ATM Forum split its technical committee into four working groups to develop specs for ATM signalling, traffic management, a broadband intercarrier interface (B-ICI), and a data exchange interface (DXI) similar to the one used for SMDS. All of these groups have promised to deliver by June at least a basic set of specifications that will enable planners to start building ATM networks.

The Forum's working group on signalling is focusing its attention on end station signalling, the method an end station uses to set up an end-to-end call. The current UNI specification defines how an end station and a switch communicate using permanent virtual circuits; end station signalling will add the ability to set up switched calls.

The ATM Forum will publish its signalling document as an addendum to its existing UNI 2.0 specification.

Critical Flaw

The signalling committee has also decided to tackle what is considers a critical flaw in the CCITT's forthcoming Q.93B spec: Lack of support for multicasting, the ability of an end station to broadcast information to several other end stations simultaneously.

The Forum's extension to Q.93B also should be ready by June, according to Doug Hunt, a member of the signalling working group. Once the specification is developed, the Forum plans to present it to the CCITT for formal approval, by way of the ANSI T1S1 committee. ANSI is the US representative to the CCITT in telecommunications matters; membership in the CCITT is limited to nation bodies, rather than companies or individuals.

The ATM Forum signalling group is also working on specs to define an address format that would work for both WANs and LANs. This work involves political savvy as well as technological expertise: most telecommunications carriers expected the address format to be E.164, the format used for telephone numbers and for SMDS networks, while computer makers expected TCP/IP-type addressing, such as that used in the Internet.

E.164 addressing imposes a geographically hierarchical structure, which could be essential for offering public ATM services, but E.164 numbers can be assigned only by carriers, not private users.

The Internet scheme supports a hierarchy based on organisation rather than geography,

which is more appropriate for private networkers but doesn't fit as well into the public network model.

The ATM Forum's solution was to compromise. At the group's meeting in January, both sides agreed to accept an addressing scheme based on the OSI's network structure. These addresses can be up to 20 bytes long, and will include *both* an E.164 and TCP/IP component. As with the multicast enhancement, the ATM Forum will present its addressing spec to the CCITT for official approval.

Managing Traffic

The Forum's working group on traffic management is also looking to address issues that the CCITT and ANSI have been slow to address. The existing UNI spec doesn't include a description of how to manage the flow of data between end stations and ATM switches. Defining traffic management involves specifying the contract between the network and the end user, says Dave McDysan, Chairman of the working group on traffic management.

The parameters that are needed to define the contract between the user and the network fall into two camps: Traffic parameters are those that, logically enough, define the contracted traffic, such as data rate and burstiness. Quality of service defines the level of service a user can expect for a given type of call (or, alternatively, the service the network can provide). Quality variables include average delay, range of delay, and the loss ratio, or the percentage of cells that can be lost by the network without adversely affecting the call. Other issues that need to be resolved involve ways in which the network handles such factors as congestion.

Connecting Networks

The B-ICI specification governs the interface between two ATM networks and without such an interface, ATM can't become a universal standard.

The B-ICI comprises several features, including what's called the multi-service interface specification. This spec defines ways in which other services — such as frame relay and SMDS — connect to an ATM service. The first version of the Forum's B-ICI spec will specify the way in which two frame relay users or two SMDS users can connect over an ATM backbone.

Developing the multi-service interface spec is a complex process, notes Richard Breault, who chairs the ATM Forum's B-ICI working group. For instance, defining how a frame relay service connects to an ATM service involves spelling out exactly how the frame relay-to-ATM conversion is actually done. Frames could simply be split into cells — a process that Breault calls encapsulation.

But encapsulating frames in this manner compromises service quality; a frame that has been marked as being eligible for discard would be treated as carefully in the asynchronous transfer mode network as one that isn't discardable, effectively destroying the differentiation between the two.

Mapping every function available in frame relay-to-ATM would ensure a uniform quality of service, but it could prove daunting and overly complex because there is no perfect match between ATM and frame relay service parameters. Breault expects the solution chosen by the working group to be "somewhere in between" total encapsulation and a complete functional mapping.

The ATM Forum's B-ICI group also is working on a traffic management specification for the interface. Because of the complexity of developing the multi-service interface, Breault expects the first version of the B-ICI spec to contain only a rudimentary traffic management portion. After June, the B-ICI group will begin more intensive work on a signalling format for use between public carriers, he says.

Whistling DXI

A fourth spec likely to be ready this June from the ATM Forum is the DXI spec, which defines the interface between existing non-ATM equipment and ATM gear, like DSUs. The DXI details specifically how LAN packets are segmented into ATM cells. Under the DXI spec, routers and DSUs communicate over a V.35 or high speed serial interface (HSSI) cable at up to 45Mbps. They exchange local management interface (LMI) information as called for by SNMP.

The Forum's new DXI spec will feature two modes of operation, according to Larry Lang, chair of the Forum's DXI working group. Mode 1 devices will be able to handle up to 1,024 virtual circuits, support the CCITT AAL Type 5 protocol, and use 16-bit cyclic redundancy checks (CRCs), effectively limiting packet sizes to 8K. Mode 2 devices will handle up to 16 million virtual circuits, support AAL Types 3, 4, and 5, and use 32-bit CRCs, yielding a maximum packet size of 64K.

In March, the ATM Forum established five new working groups to go along with the original four. The new groups will work on specs governing ATM over unshielded twisted-pair cabling, network management, switch interoperability, service aspects of ATM, and testing.

The switch interoperability group will focus on developing a network-to-network interface (NNI) that will allow switches from different vendors to work together. The NNI also will enable two private ATM networks to communicate, says Stephen Walters, the ATM Forum's Vice President for committee management.

Johna Till Johnson

ATM Standards: A Status Report

NETWORK SCENARIO	APPLICABLE SPECIFICATIONS	CURRENT STATUS
Creating a private ATM network that conforms to standards	User-to-network interface (UNI)	Specification confirmed by CCITT and ATM Forum
	UNI Signalling	Being developed by ATM Forum; scheduled for completion in June
	UNI traffic management	Being developed by ATM Forum; scheduled for completion in June
Connecting devices such as routers to a public ATM network	UNI, UNI signalling, and UNI traffic management	See above
	Data exchange interface (DXI) for connecting ATM-capable routers and data service units	Being developed by ATM Forum; scheduled for completion in June
Creating a public ATM network	UNI, UNI signalling, and UNI traffic management	See above
	Broadband intercarrier interface (B-ICI) for connecting to other public networks	Being developed by ATM Forum; portions scheduled for completion in June
	B-ICI signalling	ATM Forum plans to begin development later this year
	B-ICI traffic management	Being developed by the ATM Forum; framework for specification scheduled to be available in June
	Multiservice interface specification for supporting other services (such as frame relay and SMDS) over ATM	Being developed by ATM Forum, CCITT, and Frame Relay Forum; scheduled for completion by ATM Forum in June

Electronic Software Distribution

ESD: A Rough Diamond

The networking industry today has a collection of technologies that have a chance to develop into frontline performers, rough diamonds which may or may not fulfill their promise and make it into the big league. ATM and multimedia head the current roster of networking stars, but a growing number of network managers are adding electronic software distribution (ESD) to their lists of technologies to watch.

Although ESD systems have been available for some time, it's the newest ESD products that have caught the attention of network administrators. The early ESD systems were host-based applications that performed simple store-and-forward tasks for distributing software. Today's products tap the available power of LAN servers to offer a lot more sophisticated features, including automatic customisation of individual PC stations and more robust version control.

ESD still has a few years of seasoning ahead before it is ready to become part of networking's big show, the enterprise infrastructure. Even with all the recent improvements, ESD still lacks many of the essentials for operating in corporate-wide networks. Standards are non-existent, meaning packages from different vendors will not work together.

Without a set of common application program interfaces to operating systems and other infrastructure applications, such as network management systems and help desk software, ESD cannot fulfill its primary mission: To make sure that each computer in the network is running the same version of any given application.

Interest in ESD is growing for one obvious reason: it can dramatically reduce the time, effort and cost involved in installing and updating networked software.

Software installation — particularly for LANs — has grown beyond the nuisance stage to become one of the more insidious money pits in corporate networking. According to a study by the Gartner Group, the manual distribution and installation of a software package can cost a company 21% more than the actual licensing fees for the software. The study found that a company with 2,000 PCs can spend $1 million a year just to install and distribute new software and upgrades to existing packages, with almost all of this expense coming from labour costs.

If $1 million a year just to get PC software up and running sounds extreme, consider this arithmetic. Suppose each PC requires about 20 hours' worth of attention each year to install and update software — a reasonable amount of time, given the complexity of today's applications and operating systems. For an organisation having 2,000 PCs, that translates to 40,000 hours a year to do the job. That in turn translates to employing 20 technicians full-time just to handle software installation. If the organisation spends $50,000 per technician for salary, benefits, expenses, and the like, then it's up for around seven figures per year just to load PC applications.

To curb these runaway costs, more network administrators are turning to ESD. A systems engineering manager at one nationwide systems integrator says ESD typically cuts the time it takes to install and distribute software to somewhere between a fifth to a tenth of the time it takes to handle the chores manually. Achieving that kind of efficiency makes ESD worth looking into, even at this quite early stage of development.

Newer ESD offerings help reduce costs further by heading off some typical problems that can occur when new software is installed. For instance, a program's default settings may include a printer driver that doesn't match the printer attached to a given PC. When a user prints a document with the new package, the printer either will generate a page of garbage or do nothing at all. The result, in either case, is usually an irate call to the network administrator. A number of ESD packages now available keep track of all the resources attached to each PC and automatically configure software to match those resources.

Two Views of ESD

ESD packages fall into one of two general categories: those that run on host computers and those that run on LAN servers. With host-based packages, software is downloaded from the host processor to attached LAN servers, which in turn are responsible for distributing code to their attached clients With LAN-based packages, software is loaded directly into the server for distribution to clients.

Most current ESD packages include a centralised database about each client, including such information as the amount of memory the client has and the type of network interface card drivers used. This configuration database can reside either on a mainframe or a LAN server.

An important part of setting up an ESD system is building this configuration database. Some LAN-based ESD packages perform this task automatically by continuously polling attached clients. Other packages rely on third-party utility software to poll clients. Once the configuration data is

A Sampling of Electronic Distribution Products

VENDOR	PRODUCT	PLATFORM	CLIENTS SUPPORTED	NETWORKS SUPPORTED
Hewlett-Packard (03) 272 2895	Distributed Update and Install	Unix	Unix	TCP/IP
IBM 132 426	Network Distribution Manager for MVS	MVS host	DOS, OS/2, Unix, Windows	LAN Server, NetWare, SNA
	Network Distribution Manager/2	Server	DOS, OS/2	LAN Server, NetWare, SNA
NCR Corporation (02) 964 8111	Starsentry Software Manager	Server, Unix	DOS, OS/2, Unix, Windows	LAN Manager, NetWare, SNA, TCP/IP
Novell (02) 413 3077	Network Navigator MVS/VTAM Dispatcher	MVS Host	DOS, OS/2, Windows	DECnet, LAN Manager, LAN Server, NetBIOS, NetWare, SNA, TCP/IP, Vines
	Network Navigator LAN Distributor	Server	DOS, OS/2, Windows	DECnet, LAN Manager, LAN Server, NetBIOS, NetWare, SNA, TCP/IP, Vines
Software Developments (02) 975 4777	AM:PM	MVS Host	DOS, Macintosh, OS/2, Windows	AppleTalk, LAN Manager, LAN Server, NetBIOS, NetWare, SNA, TCP/IP
Trik Connexus (02) 975 2799	Netdistributor Pro	Server	Macintosh	AppleTalk

compiled, the program is ready to run, and software can be installed automatically.

In a typical installation procedure, the ESD system checks the configuration database before installing the software. It might find that one user's workstation has a VGA monitor, a laser printer, and a CONFIG.SYS file that's set up for 60 files. Another client might have a super VGA monitor, a dot-matrix printer, and a CONFIG.SYS file that's set for 20 files. The ESD package will take these factors into account when it downloads the software to each client.

The Coming Shakeout

A flurry of activity from vendors means that more ESD packages will be on the market this year. Usually that would be good news — more products means more competition, which usually means better prices. The truth, however, is that any growth in the number of ESD products will probably create some market turmoil, and eventually result in a shakeout.

The result of various vendor mergers and acquisitions is that the host-based market has narrowed down to five products: IBM's NetView Distribution Manager MVS 4.0, Network Navigator MVS/VTAM Dispatcher from Novell, Diamond from Software Spectrum, AM:PM 4 from Software Developments, and Synchrony 2.3 from Telepartner. Both IBM and Novell also sell server-based products (see table on page 32).

The line-up of server-based products includes Software Update and Distribution System from Frye Computer, Deliveryman from Destiny Technology, Netdistributor Pro from Trik (locally available from Connexus), and Remoteware Communications Management System from Xcellenet.

A few ESD systems also are available for Unix-based minicomputers. These are: Distributed Update and Install from Hewlett-Packard, and Starsentry Software Manager from NCR's Network Products Division.

The pricing for ESD packages varies, depending primarily on the platform used and the size of the network. Some vendors of host-based packages charge a one-time fee, while others licence the software by charging a quarterly fee. HP bundles its ESD system with its operating system at no additional cost. Most server-based ESD products carry a licensing fee based on the number of supported client stations.

A Tale of Two Vendors

Of all these vendors, IBM and Novell will probably garner a significant part of the market, for a number of reasons. The most obvious one is the two vendors' unparalleled standing in the network software business; another is that each offers a host-based package and server-based package that can work with each other.

IBM's main software distribution product, NetView Distribution Manager (DM),

is now part of the vendor's Configuration, Installation, and Distribution (CID) strategy, IBM's new approach to remotely installing and maintaining software on local area networks. NetView DM Release 4 MVS resides on a mainframe and can distribute programs throughout a network.

For companies interested in LAN distribution only, IBM sells NetView DM/2. This package works independently of NetView DM, but it also can be used with it. When used together, a network manager sends new applications and software updates from an MVS host to attached network servers. The servers then automatically distribute the software to individual clients. The users on clients do not have to get involved in the installation process at all — NetView DM/2 initiates installation and transfers software.

This process does require some cooperation on the part of independent application vendors, which must make minor changes in their installation programs. Over 160 software vendors, including Novell and Lotus have announced they will alter their software so that it can be distributed automatically with NetView DM/2.

Novell entered the host-based end of the ESD market through its acquisition of Annatek. As a result of that deal, Novell gained the rights to what is now called the Network Navigator series. Network Navigator will run in MVS, VM and Tandem environments, as well as on DOS and OS/2 servers. Novell calls Network Navigator 'NetWare-aware,' which means that the program can make use of some system features on NetWare LANs.

When software is automatically installed, the program verifies conditions on the client, backs up the current software, and installs the new software. It will automatically configure both the AUTOEXEC.BAT and CONFIG.SYS files, and then it will modify any .INI files and icons used by Microsoft's Windows. When all these procedures are complete, the program reboots the PC.

Network Navigator performs some error-handling tasks and notifies the network administrator that software has been installed successfully. It also features an automatic operation mode, under which network administrators can schedule software updates and distribution in off-peak hours, when it is least disruptive to end-users.

Network Support

The ESD packages now available support a variety of networking protocols for distributing software over a network. All host-based packages use SNA to communicate between hosts and servers over WAN links. Actually, many of the server-based ESD offerings also support SNA as a networking protocol to distribute software. Several vendors, including HP, NCR, Novell, and Systems Centre, support distribution over TCP/IP.

Of all the packages on the market, Novell's Network Navigator package operates on the widest range of networks. Besides SNA and TCP/IP, it runs on DECnet networks from DEC, LAN Server and LAN Network Manager from IBM, and, of course, Novell's NetWare.

Regarding specific PC client platforms, most host-based and server-based ESD packages typically distribute software to DOS, OS/2 and Windows workstations and servers. Support for Apple Macintosh clients is less widely offered by vendors. AM:PM, from US company Systems Centre is the only host-based ESD package that will support Macintosh clients. Netdistributor Pro from Trik, and Remoteware Communications Management System from Xcellenet, are the only server-based packages that handle Mac clients. Netdistributor Pro handles Macintosh clients exclusively.

IBM's NetView Distribution Manager is the only MVS host-based product that distributes software to Unix clients. Products from US firms Destiny Technology, Xcellenet, HP and NCR offer non-host support for Unix client workstations.

Integration Woes

Although ESD tools have come a long way in recent years, they are still evolving, and their final form may be quite different from the products available today.

Regardless of how the products develop, a few steps will have to be taken for ESD to become part of the enterprise infrastructure. For instance, ESD systems must have better links to network management systems, and they must be able to interoperate.

At present, efforts to bridge the management and interoperability gaps are sparse. Some users and vendors are looking to the Open Software Foundation's Distributed Management Environment (DME) as a way of bringing some measure of standardisation to electronic distribution of software. DME already includes software distribution and licensing applications developed by Gradient Technologies and Hewlett-Packard.

It isn't likely that DME will mark the turning point for ESD standardisation, for several reasons. The distribution features offered under the DME are optional; it will be up to individual vendors to include them in their products.

Also, the current DME offerings are not full-function ESD tools. The software distributes and tracks the installation of files, but does not offer configuration management features such as updating AUTOEXEC.BAT files.

Ultimately, the task of software distribution may fall under the purview of network management systems. Vendors like Digital, Hewlett-Packard and IBM may end up bundling ESD features into their DME products. Smaller vendors may develop add-on distribution products.

Future Strategies

Proginet, a US software company that specialises in SNA and OSI, has proposed another method to distribute software: It wants to base an ESD standard on the OSI FTAM (file transfer, access and management) standard. Proginet has proposed an FTAM extension that would allow the use of FTAM as a transmission medium for software distribution.

Under the scheme, ESD programs conforming to the standard would have to be based on FTAM and Proginet's proposed extension. That would exclude existing ESD products from being part of a standardised FTAM approach.

Another possibility — and a path that's already been taken by Hewlett-Packard — is for operating systems vendors to bundle ESD features with their products. This strategy will receive a significant boost from Microsoft, which plans to include software distribution as part of the forthcoming Windows NT operating system.

Under Microsoft's approach, ESD will run as an application on LAN Manager for Windows NT servers. The feature, dubbed Hermes, will let network managers inventory the hardware and software resources on Windows workstations, install software, and control the use of applications (a feature that might track compliance with licensing agreements). Microsoft says the first release of Hermes will support Windows clients only, but adds that future releases will support other types of workstations.

Ultimately, technology won't be the only deciding factor in determining the course that ESD will take. Political questions remain to be resolved. After all, who should be in control of the distribution of software — should it be the network administrators, or centralised IS executives?

Of course, if the networking industry rallies around one standard way of handling ESD systems, political arguments would be moot. But given the industry's current lack of interest in developing ESD standards, it's possible that corporate culture could be the force which ends up dictating the course of ESD implementation.

Salvatore Salamone

GSM

It SIMs Like a Good Idea

One of the most widely touted advantages of GSM was supposedly its global reach. You could jump on a plane, fly to Europe, and then from your ski-lodge high in the Austrian Alps conduct business over your GSM mobile handset. 'Roaming' they call it, but it sounds more like dreaming.

The fact is that GSM doesn't have any special attributes which makes it better suited to global roaming than any other mobile technology, but it does have something that the other digital telephony competitors haven't thought to include — a smart card — or SIM (Subscriber Identification Module) as it's known in the trade.

Any pretence at 'universality' in GSM, is actually contained in this card: you don't need to take your handset to Europe, you only need the SIM card. This card contains your service 'identity' (authentication algorithms, PIN numbers) and a range of other service options like frequently used number lists and unique encryption keys. It provides storage for short messages too. The SIM card is therefore at the core of the call-setup process in GSM, and a handset can't operate without one.

Some GSM handsets will accommodate a cut-down SIM smart card internally, while others have a removable slot in the base. This slot takes a normal credit-card-sized SIM which can be slipped out for security whenever the handset isn't being used.

So GSM is coupled tightly with the SIM, but not vice versa. There's no logically-exclusive connection between the two, the same SIM could be used on a D-AMPS or CDMA system in the US, for instance, if the American network designers wished. This would allow you equal access and identification when using one of their handsets hired, say, at Los Angeles airport. This is a network- and handset-design problem, quite independent of the GSM air-interface and services: SIMs haven't been used in the American equipment in the interests of keeping the gear simple and cheap.

SIM KEYS

A SIM card contains a number of important encryption devices all delivered over the AXCESSgsm network:

- IMIS (International Mobile Subscriber Identity) recognised by all GSM networks worldwide;
- PIN (Personal Identification Number), the number entered to prove ownership of the SIM card;
- Ki-GSM Authentication Key, which is a cryptographic key used to authenticate the subscriber to the network;
- PUK (Personal Unblocking Key) used if the subscriber forgets his PIN; and
- Control information, such as the Access Control Class, used by the network under particular circumstances.

Security Domain's Solution

Security Domain, which is probably Australia's leading specialist in smart card technologies, is now offering GSM retailers a way of personalising these SIMs at the point-of-sale. Their networked equipment is called AXCESSgsm, and it allows over-the-line activation of a new mobile account immediately, at the time of purchase (or even without a purchase, as we will see).

AXCESSgsm is built on a network of Unix servers communicating with their client dealer-workstations, using TCP/IP over X.25. Security, as you can guess, is a major consideration since the network must link the workstations into the operator's subscription management and billing system.

Using this network, PINs can be issued immediately, and different grades of service can be selected or upgraded for the new or old user. The dealer workstations are Windows-based with a tamper-proof smart card reader which provides access control and authentication to the workstation itself: dealers need to have a dealer Integrated Circuit Card (ICC) for gaining access to the network. All essential parts of the network system are duplicated, and there's extensive use of encrypted checksums to make sure data isn't corrupted in transit.

It is interesting to note that with the GSM/SIM identity system, many business people may wish to carry a SIM card without owning a GSM phone at all. For many people the only time they want a mobile is when they travel, and so they will be content to hire rather than purchase a unit when required. Having a SIM in their wallet may provide all the mobility they need: but I'm not at all sure that Telecom and Optus will see it this way.

And since this SIM provides secure authentication and billing information in any country with a GSM network, why not extend the value of the card into payphones and hotel rooms? What we have in fact, is the first evidence of a UPT (Universal Personal Telecommunications) system where the global network is able to track you around the world.

Will the world's telephone companies get together to allow the SIM to work this way? I wouldn't want to hang by my fingernails waiting!

Stewart Fist

CDMA

Qualcomm Just Won't Go Away

A couple of years ago almost no-one had heard about Code Division Multiple Access (CDMA), and if they had, it was in some esoteric context to do with satellite systems or military security applications.

Then Qualcomm appeared on the scene and began making noises about bringing CDMA into line for cellular telephony. I had dozens of earnest electronics engineers explain to me at the time why Qualcomm's plans would never work — why CDMA was totally unsuited to terrestrial mobile transmissions because of a variety of fine-tuning power problems, and how the complexity of the system would make it too complicated and costly even if it did.

However they reckoned without the inventive skills or the drive of this small San Diego-based company. Qualcomm took on the CTIA (Cellular Telephone Industry Association) in the US which had already settled on time division (TDMA) Digital AMPS as *the* digital cellular telephony standard, and made them look again. Qualcomm also demonstrated the advantages of CDMA to the major US RBOCs, gaining a couple of converts — and then it finally sold a number of hardware giants (Oki, Sony, AT&T, etc.) as potential manufacturers.

CDMA offered a raft of improvements over D-AMPS and GSM. The main ones are:

- Three or more times the user numbers for the same bandwidth and voice quality (10 to 20 times the analogue capacity);
- Lower power from the transmitters and a consequent battery saving;
- Inbuilt security;
- Voice and data (immediately, not waiting for Phase II);
- Adjacent cell reuse of the same frequencies; and
- Greater flexibility in the usage environment (CDMA handsets supposedly can be used across pico, micro, macro and satellite cell structures).

In December 1992 the Telecommunications Industry Association's sub-committee on mobiles approved the 'technical parameters and baseline text' for Qualcomm's CDMA standard and began the final validation and verification process. In January this year, it began a trial in Tampa, Florida, with GTE Mobile Communications. PacTel Cellular and Nynex Mobile, two RBOC-owned cellular companies, have already been involved in trials.

Germany and Switzerland have also conducted field trials in CDMA, and the Koreans, ever anxious to take a technological jump on rival Japanese companies, have recently moved into the second phase of a joint development with Qualcomm of a CDMA

'Over 70% of Australia's top 1000 companies are now using EDI'*

Electronic Data Interchange (EDI), or paperless trading, is the way of the future. Australia's top companies have realised it. Isn't it time your company realised it too?

EDI is a computer-to-computer data transaction which replaces paper transactions in the purchasing cycle and in other areas of business. Australia's top companies have found that it leads to significant cost reductions and productivity gains, as well as better business and trading relationships. EDI can reduce inventory costs in the purchasing cycle by up to 90%.

Don't get left behind

To promote a better understanding of EDI, so more Australian companies reap its benefits, the Department of Administrative Services, in conjunction with Standards Australia and the EDI Council of Australia (EDICA), has developed the *EDI... A Better Way* kit.

The kit clearly explains terms, technology and practices used in EDI. It consists of an overview booklet; two videos; a handbook which explains terms, standards, systems and business issues; and an interactive presentation on computer disk.

If you wish to purchase the *EDI... A Better Way* kit, or if you would like more information, please contact Standards Australia Marketing Services on (02) 746 4700, or fax us on (02) 746 8450.

STANDARDS AUSTRALIA

1 The Crescent, Homebush NSW 2140

Technology Update

AT&T, Wiltel to Launch ATM Services

AT&T and Oklahoma-based Wiltel plan to launch an ATM service within the next year, although neither US carrier is giving pricing information or deployment specifics. AT&T's service will be available starting early next year and initially will operate at 45Mbps and allow only for PVCs (permanent virtual circuits), not SVCs (switched virtual circuits), says Jayne Fitzgerald, Product Line Manager for high speed data services at AT&T. The service will use AT&T's GCNS-2000 broadband switches and will interoperate with the carrier's Interspan frame relay offerings, Fitzgerald says. Wiltel's service will be available to beta customers in the third quarter of 1993, with general availability in the fourth quarter. The service will focus on providing channel extension capabilities and will include CPE (customer premises equipment), says Bill Wilson, Vice President of strategic planning at Wiltel. Data rates for the service will range from 10 to 45Mbps, depending on customer requirements, Wilson says.

Vendors Spar Over Interim Modem Standard

Modem makers are choosing up sides over whether to back a 19.2Kbps dial-up standard to bridge the gap between the existing 14.4Kbps V.32*bis* standard and V.fast, the 28.8Kbps spec expected to be approved early next year. Delays in approving V.fast have led a number of vendors to jump the gun with proprietary schemes that boast dial-up speeds of anywhere from 19.2Kbps to 28.8Kbps. To curtail the influx of proprietary schemes, several vendors are rallying around V.32*terbo*, a 19.2Kbps spec intended as a stepping stone from V.32*bis* to V.fast. Those in favour of V.32*terbo* include AT&T Paradyne, Data Race, Multi-Tech Systems, National Semiconductor, Sonix Communications and Penril Datacomm. Those against V.32*terbo* contend that the interim spec would do more harm than good, saying V.32*terbo* would extend the call setup sequence required for V.fast modems, have a negative effect on compatibility, and curb demand for V.fast products. Opponents include General Datacomm, Hayes Microcomputer Products, Microcom, Motorola Codex, and Racal-Datacomm.

France Pushes the X.25 Envelope

A new development effort funded by France Telecom aims to bring multimegabit speeds to X.25 packet switched networks. The proposed offering, called Flow Control Bearer Service, will operate at 34Mbps and be compatible with Transpac, France's existing public X.25 service. France Telecom awarded the development contract to RCE (Reseaux de Communication d'Enterprise); RCE's President, Remi Despres, was one of Transpac's principal architects. Under the deal, RCE has two years to develop the 34Mbps service, which will be connection-oriented and have an optional sliding window flow control mechanism, like the one used in existing X.25 networks. Making the new service compatible with Transpac means users will be able to send traffic between the two networks, which should enable them to migrate smoothly to higher speeds. The high speed X.25 service will run over the ATM network being developed by France Telecom, which expects to begin ATM trials later this year.

Cisco Demonstrates APPI at Interop

Cisco Systems demonstrated a working version of its Advanced Peer-to-Peer Internetworking (APPI) at the Interop Spring show in Washington in April. APPI is Cisco's IP-oriented version of Advanced Peer-to-Peer Networking, IBM's routing scheme which brings internetworking capabilities to SNA. APPI will combine internetworking features found in TCP/IP networks, such as dynamic adaptive routing and support for multiple media and protocols, with SNA peer-to-peer networking. In the demonstration, APPI's Open Network Node (ONN) ran on an IBM RS/6000 workstation, with Cisco routers providing the TCP/IP transport network and the APPI distributed directory services. PCs running OS/2 Extended Services acted as SNA end systems, while RS/6000s and Cisco routers delivered the APPI networking functions. The prototype fully implemented SNA LU 6.2 and Node Type 2.1, allowing the ONN to carry on LU 6.2 communication with the SNA peer end systems represented by the PCs.

network through their Electronics and Telecommunications Research Institute.

In December 1992, Telecom Australia announced that its research labs had signed a $US1 million agreement with Qualcomm for CDMA cellular telephony test equipment. Telecom has bought several base stations, a switch, a number of mobile units, and CDMA-specific test equipment.

Apparently when it heard about the purchase, Arena GSM (as it then was) was rather anxious to chase down the rumour that Telecom was planning to junk GSM and move directly to a CDMA system — but it transpired that the GSM network is too far developed now to be abandoned. Telecom says it is looking at CDMA technology as a possible migration path to Personal Communications Services (PCS) in the future.

"CDMA is a promising technology and we're keen to establish whether it is the most appropriate option for our long-term mobile network programme," says Tony Bundrock, Telecom's Manager of Radio and Satellite Networks. "Proving this technology in local conditions will provide us with a window to offer advanced services as they become available, allowing implementation with minimal disruption and delay," he says. I guess that means we'll use it when the time is right!

Handset Released

When you consider that CDMA didn't come out of the woodwork until about the time Austel committed Australia to GSM (even though GSM was still only on the drawing board), the progress that Qualcomm has made in developing the technology is quite astounding and it is increasingly certain that CDMA will find many applications in future transmission technologies, up to and including digital television.

Qualcomm has now introduced a dual-mode (CDMA and analogue AMPS) telephone (the CD-3000) which will intelligently switch between the services available in a region. It has a menu-driven interface with a large display, hands-free operation, memory for 103 numbers with alpha-numeric identification, scratch-pad memory, auto redial, and password security.

When operating in the CDMA mode, it has access to the digital control channel which can deliver calling line identification (CLI), automatic voice mail notifications, and extended services such as circuit and packet-switched data communications, facsimile, advanced paging, and simultaneous voice/data transmission. The digital control channel can provide a direct link to the D-channel for ISDN services.

Qualcomm's chips are now being made available to other manufacturers, including Mitsubishi, Motorola, Nokia, Oki, Sony, Panasonic and AT&T. Complex chip design is Qualcomm's speciality.

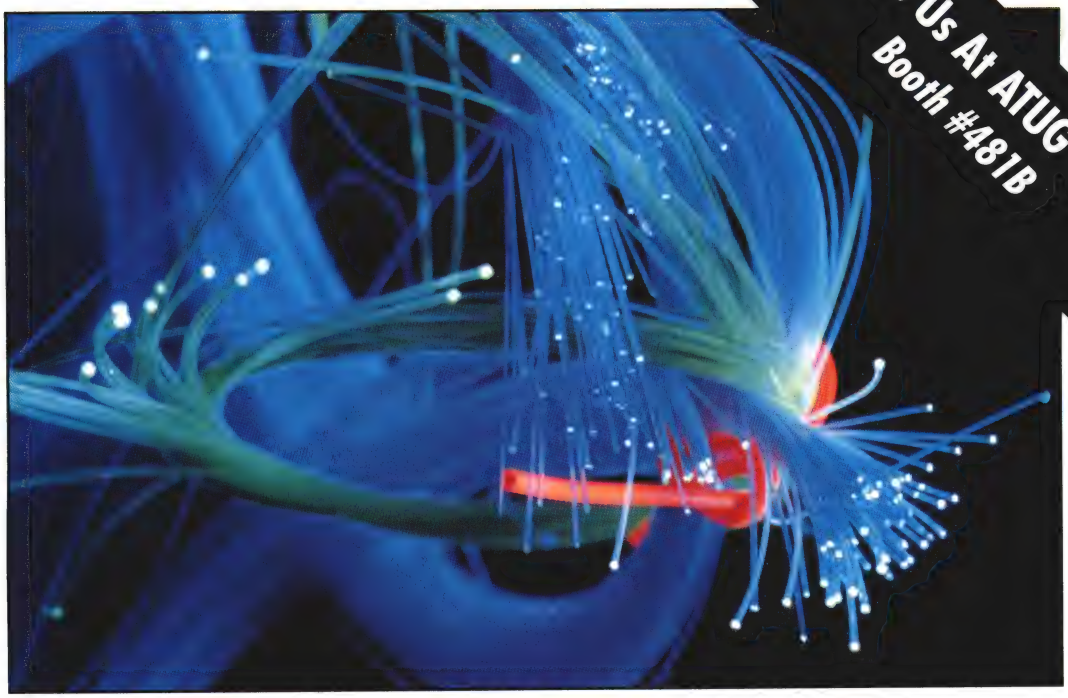
In March this year, it announced the development of an 0.7 micron CMOS ASIC with 450,000 transistors which combines all of the functions of the Mobile Modulator, Mobile Demodulator and Viterbi Decoder in a single chip — cutting the component count (and size) even further, and reducing power requirements for handsets by 50%.

Qualcomm's joint venture with Loral in Globalstar may even see the launch of a whole system of low-earth orbit satellites for worldwide communications using the standard cellular-based handset (see 'The Global Mobile Communications Race,' *Australian Communications* July 1992).

A rival satellite group, Celnet, is also still planning a geostationary-based satellite system across the US which transparently interacts with the terrestrial cellular system, and this is planned around modified Qualcomm handsets. With this CDMA approach, Celnet claims to be able to provide 700,000 simultaneous voice channels covering the total American landscape, using only a very limited amount of spectral bandwidth.

Stewart Fist

See Us At ATUG '93
Booth #481B



ATM For Today's Fiber Backbones

Many people view ATM as the perfect technology for future high-bandwidth desktop links and video networks. But ATM can also help solve today's network problems. Such as, adding performance to clogged backbones, relieving overburdened Ethernets and Token Rings. Or lowering the high cost of network changes. Fibermux is developing ATM solutions to solve these real network problems.

Called ATMosphere™, our ATM backbone hub can be integrated into your network as a high-speed switch to segment Ethernet and Token Ring LANs, lowering the cost of network changes. It can also be implemented as an enterprise-wide backbone solution, providing bandwidth on demand and increasing reliability.

ATMosphere, based on Crossbow*Plus* , our 14-slot intelligent hub that is available today, supports Ethernet, Token Ring and AppleTalk networks. With Crossbow*Plus*, you have the flexibility to migrate to ATM when you need it without buying new hubs. *Ever.*

And because ATMosphere uses ATM to enhance today's LANs, you keep your existing network cabling, interface cards and management tools.

The promise of ATM is not in the distant future. You can use it today without breaking the bank. At Fibermux, we're working on it now. Let us show you how easy it can be to migrate to ATM with ATMosphere. For more information and our ***free*** ATM brochure call your local authorized Fibermux dealer.

Fiber Backbones • Multi-LAN Hubs • Structured Network Solutions

ADC Fibermux®

JNA Network Services
Tel. 02.417.6177

MM Data Networks
Tel. 02.980.6922

Fast Networks Pty., Ltd.
Tel. 02.963.0572

Research Notes

CSIRO AUSTRALIA

The Security Problem on Open Networks

Melfyn Lloyd

With the growth in wide area networking, network security has come to be regarded as a mission-critical concern by a widening circle of organisations. Lately, the security concerns of commercial and government enterprises have been compounded by a growth in distributed computing and multi-user computers, client/server models, and even more so by the proliferation of portable PCs and dial-in access to networks. We need these 'open' networks, but we must also keep messages on those networks private and impregnable. Ultimately, all organisations which participate in large networks need to ensure their privacy.

We cannot solve this problem by creating completely safe backbone networks. Too many people have, and need, privileged access to intermediate systems and networks which introduce added layers of software and hardware and their own security problems. The solution is to use cryptography. Once the preserve of KGB and CIA, this technique has spread to the Australian banks, for example, and is under evaluation by Federal departments.

Unfortunately, there are no simple answers to encryption on open networks, a topic of research for CSIRO's Division of Information Technology.

Public Keys

Cryptography goes beyond encryption, the basic procedure of scrambling information content so that only a person with the appropriate 'key' can decipher it. A key could constitute any number of access mechanisms: Passwords, physical keys to access the hardware, even smart card IDs. The difficult tasks are to manage keys and to build secure applications. And then we have the practical problem of building the infrastructure that secure applications need.

The choice of encryption technique is less important than often pictured in folklore; there are several adequate alternatives, and they aren't of much interest except to mathematicians and lawyers. Inasmuch as any encryption system rests on matching the user's identity and access privileges, the infrastructure used for key allocation and management is the ultimate determinant of both system security and user convenience.

Traditional cryptography makes use of secret keys. You can build secure systems with secret key cryptography. But a shared secret is very hard to control, and in secret key systems the user keys are invariably known to a system manager. Here, the mathematicians came to the rescue with the concept of public key cryptography. This was invented by Diffie and Hellmann in 1976, and the first practical implementation came in the early '80s with the RSA algorithm. RSA is patented in the US but not elsewhere.

With public key cryptosystems there are two keys in a pair: The public key and the private key. A Certificate Authority (CA) is responsible for allocating public keys to individuals (in Australia, a number of prominent commercial institutions are now discussing who is appropriate to be a CA in areas such as banking). The advantage of the system is that when something is encoded with the public key, only the holder of the private key can decode it. It doesn't matter how many people know your public key — in fact you'd want it broadcast as widely as possible. Meanwhile, you do not have to share your private key with anyone.

The other convenient property of public key systems is that if you encrypt something with your private key then everyone can decrypt it with your public key. They know that the message must have come from you because only you could have encrypted it. This can be used to create what is called a 'digital signature,' used to authenticate the authorship of documents. The move towards electronic document interchange systems could not proceed without adequate authentication procedures. When optimistic forecasters speak of a future 'digital economy' the implication is that we shall manage to match in digital form our myriad of paper-based security systems, seals, legal conventions and commercial practices.

There we have the basic ingredients to preserve privacy (through encryption) and trust in the origin and authenticity of the message (through digital signatures). That is not to say there are no security risks. The next problem is how to distribute the public key. If we can be tricked into encoding our secret with the wrong public key then we'll give the secret away. If we can be tricked into accepting the wrong value for someone else's public key then we can be tricked into trusting the wrong message. Security of the system relies upon keeping the public key of the Certificate Authority secure, but using that we can obtain other public keys with confidence.

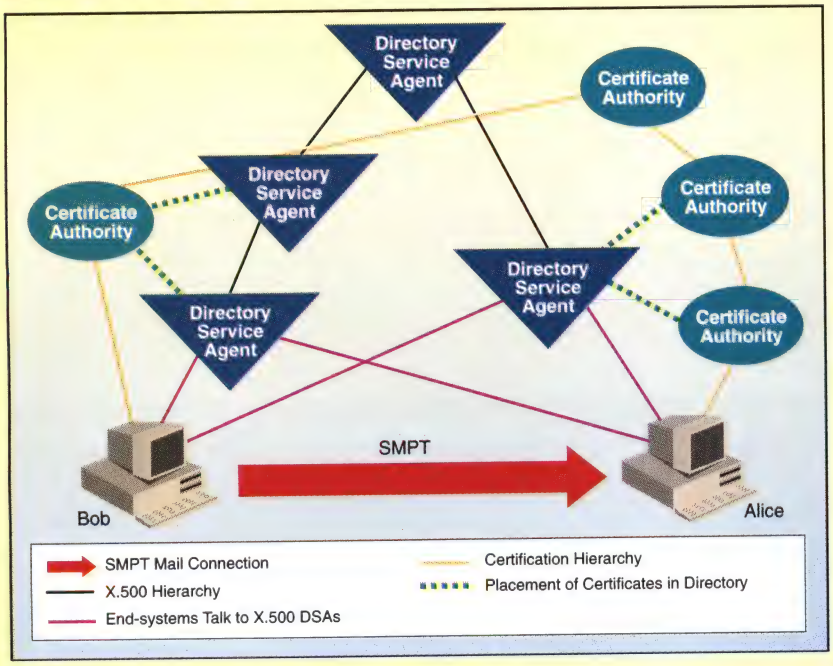
Melfyn Lloyd is the Program Manager of the Open Systems Program for the CSIRO's Division of Information Technology. The Division's Open Systems Program plays a leading role in Australia in the design, development and standardisation of open and distributed systems. If any further information is required about any of the projects or tools mentioned in this article, please contact the author on Tel: (03) 282 2611 or Fax: (03) 282 2600.

Keeping Public Keys Secure

A solution is contained in the CCITT/OSI standard for key management: X.509/ISO 9594-8. This describes how nominated Certificate Authorities create signed documents testifying to the correct value of a public key, and how these certificates are stored in the X.500 Directory so that they can be easily retrieved. An example of an X.509 application is the Internet standard for Privacy Enhanced Mail (PEM). Recently released under the title RFCs 1421-1424, it is a complex design that has taken years to complete. The figure on page 41 shows how much extra infrastructure and network activity PEM electronic mail using the X.500 structure for issuing certificates requires.

X.509 is a framework for building secure applications; each application has to have security added to it, and every application will be different. X.509 is not a magic wand that you wave over insecure applications to make them secure. Magic wand solutions, for example using cryptographic techniques to provide network layer authentication and privacy, only work in selective situations where trust between the end-systems is the only requirement. This would, for example, not provide security for mail which passes through an intermediate mail relay.

Bob Calling Alice, Via PEM



A typical transaction within a public key security system might run as follows:

1. Bob decides to send a mail message to Alice and his mail software asks the local DSA (X.500 directory service) for information about Alice.
2. The local DSA redirects the question to the relevant DSA.
3. That DSA returns information about Alice including her e-mail address and a certificate for her public key.
4. The X.509 software verifies Alice's public key from the certificate. It does so by building a certificate chain; this might require getting a certificate for Alice's CA and so on until the top of the CA hierarchy is reached. Perhaps more likely, Bob's software has already incorporated Alice's CA's public key in his list of trusted CAs.
5. The mail software generates a PEM message using Alice's public key to encode the message and also using Bob's private key to add a signature to it.
6. The message then goes to Alice in the normal way.
7. Alice's mail software receives the message and decrypts it with her private key.
8. To verify Bob's signature, the mail software needs to access Bob's X.500 record. It asks its local DSA.
9. The local DSA redirects the question to the appropriate DSA which responds with Bob's directory information.
10. Alice's mail software verifies Bob's public key using the certificate from the directory.
11. Alice can now verify that the message was sent by Bob and has not been changed.

Our most immediate concern is to make existing network applications like mail, log-in and distributed file systems more secure.

Securing the Remote Login

There are new applications for networks, EDI amongst them, which cannot be contemplated without a security infrastructure. Meanwhile, there is an immediate need to make current network applications secure. CSIRO DIT's Open Systems Program is designing and preparing to implement some secure applications using X.509. We are taking advantage of two experimental implementations of X.509 (OSISEC from University College, London and SecuDE from the University of Darmstadt) to give us an experimental environment in which we have considerable control.

Our first target for a secure application is the remote login protocol. On the Internet, Telnet is the protocol and there is a standard for adding encryption-based authentication to Telnet as well as a draft standard for adding end-to-end encryption. Both are very general, encompassing any conceivable security system.

Obviously, a prime opportunity for intercepting and discovering someone's password is when it is being used or sent. Previous work has concentrated heavily on authentication procedures which don't pass clear text passwords across the open network. The problem is that after logging in remotely one often needs to enter other passwords in order to enter some protected subsystem. For this reason you need end-to-end encryption in a remote login setup; if you get that right, the problem of having clear text passwords crossing the network goes away. CSIRO DIT's first challenge is to tackle this need by adding X.509 security.

Further Information

Much of the information needed to understand networking issues is found on the Internet, and businesses not connected are at a disadvantage. Certainly Australia is at a disadvantage compared to the US and much of Europe because commercial Internet connectivity is not available here. But if you do have Internet access, an article by Paul Fahn, 'Frequently Asked Questions About Today's Cryptography,' can be obtained free of charge by anonymous ftp to rsa.com in pub/faq.

For information on CSIRO DIT's involvement in secure networks, you may contact Melfyn Lloyd or Bob Smart. Users interested in key management and certification are specifically invited to become involved in our current X.509 experiments.

The X.509-based File System

A more ambitious but far-reaching project for CSIRO DIT is the X.509-based File System which will avoid the severe security problems of current distributed file systems — a file system living in an open network which people can rely upon without having to trust unknown system administrators and unknown quantities of network hardware and software.

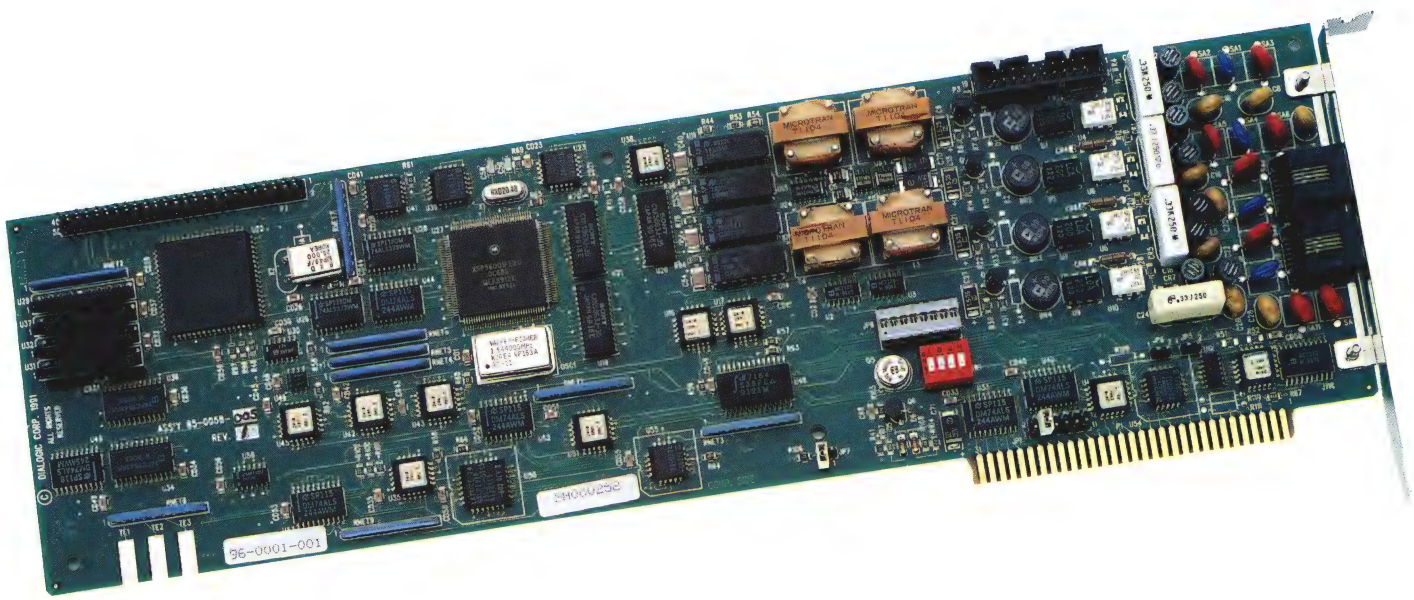
The computational costs of using cryptography could be significant, and it ironically rises in line with advances in computing power. By convention, an encryption algorithm is judged 'secure' with reference to the time it would take an intruding computer to solve the algorithm, and as these potential intruders grow in computation power, the complexity of encryption needs to rise in defence. Caching can be used to reduce the computation time cost, but even so the X.509-based File System will be appropriate only to some applications. An example of a suitable application is the central storage of executable binaries. Since these change slowly, caching will work well.

The X.509-based File System will use digital signatures so that you can execute a file's code without having to trust the file system server or its administration. It will use encryption so that files can only be accessed by the people intended and cannot be read even by system administrators of the server machine.

CSIRO DIT believes that cryptography is a necessary ingredient of networks, and we encourage industry to become involved in this particular research because of its potential benefits to the participant. Organisations which participate will gain the benefits of secure networking much sooner, and the capacity to implement applications which are impossible without strong security.

Melfyn Lloyd and Bob Smart

Evolutionary . . .



After years of proving in the world's most technologically advanced telecommunications markets, Dialogic's call processing components have been approved for use in Australia. More than 700,000 ports are in daily use in more than 30 countries and Dialogic has by far the broadest range of call processing products available.

Now Dialogic's evolutionary D/41D four channel call processing boards have been granted Austel's seal of approval, eliminating the requirement for line isolation units.

The D/41D excels in all measures of performance. PitchPerfect Speed Control lets the listener speed through a recording at a rate up to 50% faster than normal and still hear information clearly. And LevelPerfect volume control gives the caller's telephone the volume control normally found only on expensive feature phones.

Dialogic's state of the art Global Tone Detection rapidly recognises signalling and control tones, like fax or modem tones, from systems all over the world. When a call is complete, our systems recognise the disconnection tone instantly, saving line time.

Dialogic provides accessibility to complementary products through our industry-standard Analog Expansion BUS. Speaker-independent voice recognition cards are a specialty, and Dialogic offers an Australian vocabulary.

Before you invest in call processing technology, consider the merits of Dialogic's evolutionary call processing boards - the product of years of experience designing and supplying boards for the world's most advanced telecommunications markets.

DIALOGIC®

VOICE WITH VISION

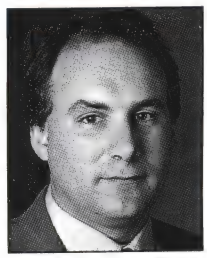
FOR A CATALOGUE OR FURTHER INFORMATION, CONTACT DIALOGIC NEW ZEALAND, PH: +64-9-302 1831, FAX: +64-9-302 1793

Dialogic Corporation, Parsippany, New Jersey, USA. PH: +1-201-334 8450, FAX: +1-201-334-1257

Offices in Tokyo, Auckland, Kuala Lumpur, Brussels, London, Ottawa, Parsippany

LAN VIEWS

Avoiding Pain in the Backbone



Graeme Le Roux

About 10 years ago many companies were converting the serial cable plant associated with their minicomputers to Ethernet. A lot of the cable which was installed at that time is still running through the Australian body corporate, along with early STP for Token Ring and, of course, Twinax. Certainly this original cable plant has been expanded and re-routed, and sections of it have been replaced. Companies have moved, merged and migrated to new standards, but in many cases at least some old cable survives and is still in use — probably with the latest bridges and routers attached to it.

Basically, most of this cable is PVC on the outside and assorted layers of copper and plastics on the inside. In most cases the manufacturer intended that it remain within specification for around 10 years, given environmental conditions remaining within appropriate limits. In the case of network backbones this is a perfectly reasonable expectation. Such cables are laid in cable risers where there is no sunlight to damage the cable's PVC cover and, typically being in the centre of a building, the temperature is reasonably stable. But over time cable will degrade and, if left long enough, this will lead to unacceptable signal attenuation, increased susceptibility to interference and impedance variations, all of which will result in an increasing number of intermittent problems which will be almost impossible to trace.

Once again prevention is cheaper than cure, and thankfully, it is also reasonably simple. Have your network backbones tested regularly every two years, as well as after any accidents such as fires, burst water pipes or roof leaks. This will provide you with historic data which you can use to plan cable replacement and to spot excessive degradation.

Eventually, you'll have to replace a backbone cable or install one in new premises. If it's going to last 10 years or so it's important it be installed carefully. That means care in planning the path of the new cable and care in handling the cable during installation.

Most traditional vendors of minicomputers and mainframes who sell network transmission systems provide cable planning and installation services. Such vendors usually sub-contract cable installation work, while drawing up cable plans and testing the installation themselves. They then guarantee the work for 12 months. If you do not have a relationship with such a vendor, then have a full test done on your new cable by someone other than the company doing the installation, and ensure that you get a clear statement of the warranty conditions on the work. Any faulty cable — particularly where thick Ethernet is being installed — should be replaced.

In the last 10 years, more and more buildings outside the CBD have been built lower and wider than those built in the early eighties. That means long horizontal cable runs and relatively short vertical rises. Campus-type sites containing more than one building are also becoming more common, and many companies now have more than one office in a given city. While ISDN and various fibre standards generally handle multiple offices, multiple sites and the vertical rises within buildings cost effectively, the increasing floor areas in modern low and medium rise sites require a different approach to that traditionally used in a high rise office block.

"Modern low and medium rise sites require a different approach to that traditionally used in a high rise office block."

Architectural experiments aside, the floors of most high rise buildings are basically square with a single service trunk, which is also square, up the centre. The service trunk contains one or two cable risers for data cables. Generally, you simply run a backbone down each riser and tap into it at each floor. On each floor you install a rack mount cabinet containing transmission systems equipment, servers, and so on. From these cabinets you then run cables to individual workstations.

Today, such cables are mostly UTP and are generally simply draped individually in a more or less straight line across a false ceiling to a point near each desk top, where they are brought down some form of conduit to a socket. Since the floor area in a high rise is limited, the maximum number of cables is generally no more than 60 or so, and their runs generally average less than 50 metres.

In a medium or low rise building there is no such constraint on floor space. Floors are generally rectangular, with either two square service trunks or a single rectangular one. Either way, one generally finds at least two cable risers, one at each end of a single rectangular trunk or one per square trunk. False ceilings are also more crowded as the larger floors require more air conditioning ducts, electrical wiring, and so on. Most importantly, there will probably be many more workstations per floor, perhaps double the number in a high rise, and the average distance a cable has to run is likely to be between 50 and 75 metres.

There are three basic ways to deal with this situation. Use the same backbone layout I've described for a high rise, but, rather than run individual cables, use patch panels to simplify the cabling. Alternatively, you can bring the backbone out of a riser, and run it in a loop around the floor and back to the riser. You can then tap the cable, say in the centre of the four quarters of the floor, and place a hub at each tap.

The third alterative is to use a 'backbone in a box' configuration (also called a 'collapsed backbone'). Run a cable from one central router to a hub in, for example, the centre of each quarter of each floor, and then run UTP workstation cables from the hubs. Each alternative has its pros and cons. Using patch panels is cheaper than multiple hubs per floor, but you get more connectors between workstation and hub than using a direct cable. People also often 'forget' to document changes to patch panel configurations.

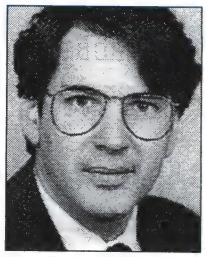
The second alternative costs more than patch panels, but it is cheaper than the collapsed backbone solution. Its main drawback is that the backbone is exposed in the false ceiling, along with every other cable in the building not safe in a riser.

The final alternative, which is the most expensive and is best implemented with fibre, is my preferred option, subject to cost. If a single fibre is damaged only a single section of a single floor is affected. The hubs which are placed on each floor need not contain a bridge or router, since these functions are required only on the 'backbone in a box.' And finally, the backbone bandwidth available is equivalent to the bandwidth of the central box. This is inevitably several hundred megabits/second.

Graeme Le Roux is a Director of NSW-based Moresdawn Pty Ltd and specialises in local area network consulting services.

INTERNETWORKING

Too Many Protocols Can Break the Corporate Backbone



Nick Lippis

There's something vaguely comforting about the 'multi' in multiprotocol routers and backbones. Not only does it mean a router or network can handle more than one protocol at a time, but it suggests that there's always room for one more. The fact that most routers support a wide range of protocol types reinforces the implication that 'multiprotocol' means 'many protocols.'

But as net managers build their multiprotocol internetworks, they are finding there is a practical limit to the number of protocols a backbone can reasonably accommodate. Backbones simply do not scale well as more protocols are added. This limitation doesn't diminish the importance of multiprotocol backbones to corporate networking, but it does mean that planners have to take care to keep protocol mixes under control as they build their internetworks.

Judging from the 400 or so network managers who attended a two-day tutorial I conducted on LAN/WAN interconnection, the news that multiprotocol backbones don't scale well is not shocking. In a survey conducted at the tutorial, many attendees said that although they definitely intended to build a multiprotocol backbone, they were holding back on their plans. They cited a number of reasons for delaying backbone plans, including high transmission costs, a lack of network design and management tools, buggy router software, poor hardware reliability and the high cost of equipment. But the main reason cited was difficulty in managing multiple protocols simultaneously.

This problem stems in large part from the way multiprotocol environments work. Each protocol brought into a multiprotocol backbone operates independently of the other protocols, which means that each protocol must have its own logical network. A corporate backbone that carries TCP/IP, DECnet, IPX, AppleTalk, and bridged protocols like NetBIOS, SNA, and DEC's Local Area Transport (LAT) must have for each protocol an addressing plan, a logical and physical topology, mechanisms to overcome routing algorithm limitations, and a host of other items specific to the individual protocols.

"Adding a protocol to a backbone involves more than an incremental increase in network complexity. Often, a new protocol requires a complete network redesign."

Adding a protocol to a backbone involves more than an incremental increase in network complexity. Often, a new protocol requires a complete network redesign. Router capacity and wide area bandwidth must be reassessed and possibly increased to accommodate the added burden.

Along with this redesign, new network segmentation schemes may be needed as logical networks are added to a multiprotocol backbone. Developing logical segmentation schemes is very complex, and to make matters even more interesting, PC LAN protocols like IPX and AppleTalk don't even have the logical segmentation features included in TCP/IP and DECnet.

The lack of congestion management algorithms that span multiple protocols complicates the process further. Because congestion management algorithms don't exist, there is no way for one logical network to know how much bandwidth is being used by the other logical networks. The only congestion management available at this point is of the trial-and-error variety: Each logical network tries to use as much bandwidth as it needs and throttles back to a lower speed when the protocol detects excessive delay or lost packets.

Some protocols can't even perform this type of indirect congestion management. When a bridged protocol like NetBIOS can't get the bandwidth it needs for an application, it doesn't throttle back — the application just times out and the session is dropped. Priority queuing and other such router features don't really solve this problem. Giving one protocol priority over another only lets managers decide which traffic is going to fall victim to congestion first.

As if all these drawbacks aren't enough, internetwork planners can't even count on the availability of design and management tools to help build their backbones. The number of network design tools that can help predict network performance levels is limited. Router vendors don't provide hooks into their routers or network management systems that would enable managers to channel information about traffic patterns or volumes into an accounting application to establish a workable charge-back system for different user groups. But even with all these problems and product shortcomings, it's still possible to build an effective and efficient multiprotocol backbone. The keys to success are careful planning and design.

First, limit the number of protocols to be included in the backbone to no more than four. The protocols chosen should all be routable, such as DECnet, TCP/IP, AppleTalk, and Novell's IPX/SPX. Bridging protocols should be avoided because of their lack of congestion management features, their potential to permeate the network with broadcast storms, and their poor use of wide area bandwidth.

Managers have several alternatives for getting bridged protocols off the backbone. One approach is to discourage their use by setting internal tariffs that penalise departmental groups that insist on using bridged protocols. If user departments are charged a heavy premium for turning on a bridged protocol, they will probably find a way to make do with routable protocols.

Encapsulation is another attractive option. Most routers are now able to encapsulate 3270 and LAT traffic in TCP/IP. The traffic can then be routed over the wide area. Encapsulation isn't the most efficient way to route data but it works reasonably well. But even if encapsulation is used, network managers should continue to work on user departments to encourage them to phase out application development efforts that rely on 3270 or ASCII interfaces.

As well as working to eliminate bridged protocols, managers also need to find ways to cut down the number of routable protocols used in the network. One way is to establish guidelines that call for all new computer systems to provide for interoperability using TCP/IP, which is available for almost every system now made. Protocols responsible for relatively low amounts of network traffic could be converted to TCP/IP via gateways or encapsulation.

The ultimate goal of the multiprotocol backbone is to help corporate networks evolve from a disparate collection of overlapping proprietary networks to one big open system. Ironically, that means making do with as few protocols as 'multi' will allow.

Nick Lippis is President of Strategic Networks Consulting. He is based in Rockland, Massachusetts.

Token Ring MAUs That Shine

008-803-219

MAUs are just one of our LAN connectivity solutions. The Andrew ***Token Ring Product Guide*** *provides information on Andrew bridges, media management, repeaters, adapter cards and fiber optic product offerings. Call for your* ***FREE*** *copy.*

Extended Distances on 16Mb UTP.

With Andrew ***Token Ring MAUs***, checking a station's status in your wiring closet is no longer a shot in the dark. Our MAUs have bright LEDs so you know a port's activity with just a glance.

Adapting these MAUs to different environments is easy because they come standard with multiple mounting options. What's more, our MAUs are compact, taking up only *one* rack space. The results? More units per rack. Easy installation. Simplified network management.

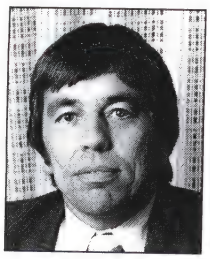
Add stations in a flash. No hassling with insertion tools, you simply use the front panel reset button. Active connections continue without interruption.

Whether your network cabling is Fiber Optic, Type 1 or Unshielded Twisted Pair, 16Mb or 4Mb, Andrew has ***Token Ring MAUs*** whose sparkling performances will match your requirements and exceed your expectations.

Complete Communications[SM]

ANDREW

Andrew Australia, 153 Barry Road, Campbellfield, Victoria 3061. Phone (03) 357-9111, fax (03) 357-9110.



OSI Naming and Addressing and Distributed Applications

Alan Lloyd

From a superficial level, naming and addressing seem to have little to do with distributed applications and the application environment. However, as a growing number of organisations move into the design of distributed systems which incorporate distributed applications, the issues associated with naming and addressing become a major concern.

Previous articles in this series have demonstrated that OSI is not just about protocols; OSI is really about standards for distributed systems. Because distributed systems, like protocols, have components that require names and addresses, naming and addressing is one of the most important issues of the system design process.

The First Network Design Step

The first step in any new network design is to determine the naming and addressing scheme, because this impacts its routing, its organisation, its distribution and its efficiency. As these are major characteristics of networks (and business organisations), naming and addressing schemes must be determined at the design stage and not during the network's implementation.

Naming and addressing schemes are entrenched in a system's total design. The naming and addressing used in distributed systems relates to the protocols, the protocol profiles, machines, functions, information objects and the users of the system.

Every proprietary naming and addressing scheme is for a proprietary system. By definition they do not use globally standardised schemes, as used in the telephone network, X.25 or X.121 packet switching networks or postal systems. If proprietary systems expand and the world moves to standardised networks, then the risks of a proprietary system failing to interconnect will increase.

With distributed systems that use file servers, messaging and directory services as common system functions, the user now has to configure into the distributed technology details that relate to the structure of the business organisation and the people in it. In most organisations, this is a new job for computer administrators. Historically, proprietary, host-centric systems did not care what address allocation they used because the entire system was isolated from the world and any addresses just had to be unique within the local system.

Computer addresses are now becoming the same as any other global identifiers. When people get a telephone, the carrier gives them a unique global address — a telephone number, and there is no risk to the user of being given a duplicate address. Similarly, when land is allocated for building, the local council gives it a unique postal address. Again there is no risk of duplicate addresses.

With distributed IT systems, the user is in fact performing the role of the carrier, council or postal service in determining the references used, both within the IT system and with reference to all other systems. These references relate to the geographic distribution and the organisation of the business enterprise.

It is highly desirable that a configuration is globally unique and remains fairly static. If it doesn't, reconfiguring a distributed system usually means loss of business service, which equals loss of revenue.

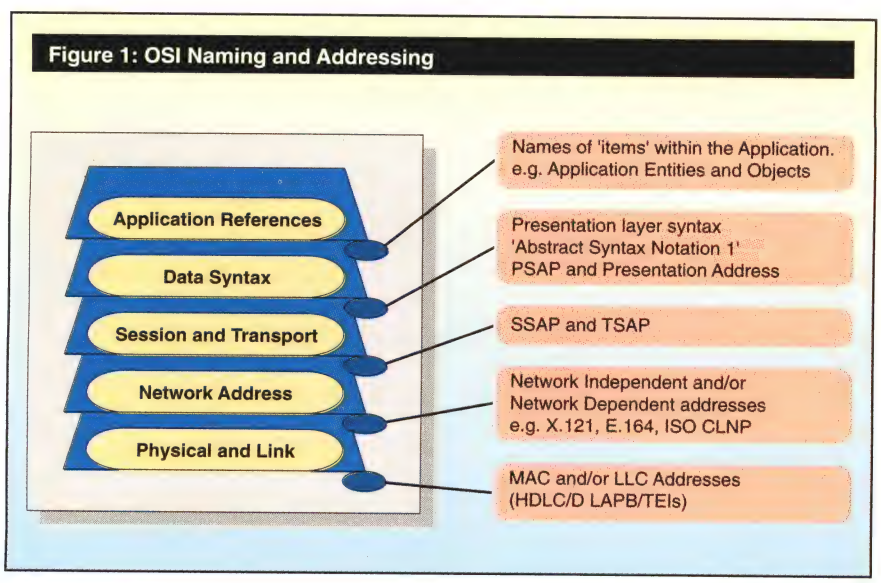
This is one of a series of open systems tutorials by Alan Lloyd, Strategic Developments Manager for Datacraft Australia. Alan represents Australia on numerous international standards bodies and is the co-author with Gary Dickson of *Open Systems Interconnection* (Prentice Hall, 1992).

Consistent and Unique

One of the objectives of OSI is for it to interwork across a chain of international and national interlinked networks and sub-networks. The OSI network will therefore need to support multiple connections to other networks, both public and private, so that business entities can cooperate in a common business enterprise. It will use OSI-based naming and address forms which have global formats. In OSI terms, the network is a sub-network of the total national, international and global communications network system. An organisation need not necessarily connect to other networks, but the naming and addressing space of the network needs to be consistent and unique within the global framework.

Within OSI's seven layer reference model, the address points on the layer boundary to the next layer above (e.g. the transport layer) is referred to as the NSAP (Network Service Access Point). Other layer addressable access points are referred to as Service

Figure 1: OSI Naming and Addressing



Access Points (SAPs). For the Transport, Session and Presentation layers these are TSAPs, SSAPs and PSAPs.

The NSAP has a number of components, generally one or more identifiers and the supporting network protocol address field. To address an application within a system a complete application address would consist of an NSAP, TSAP, SSAP, PSAP and the application entity title.

Figure 1 shows the OSI reference model and the selection mechanisms used to access reference points at specific layer boundaries. The application and the network layers are the most important in the global naming and addressing scheme. The application layer handles naming (what things are called) and, in some cases, addressing (e.g. X.400 MHS Originator or Recipient addresses).

The network layer handles addressing of NSAPs and, possibly, protocol-dependent addresses such as X.121 for X.25 packet networks and E.164 for ISDN. The Presentation, Session and Transport layers have addresses, but because they are relative to and unique to the end system, their values are neither nationally nor globally defined or administered. From a business perspective however, they should be administered and allocated in a consistent way across the total system.

NSAP Addressing

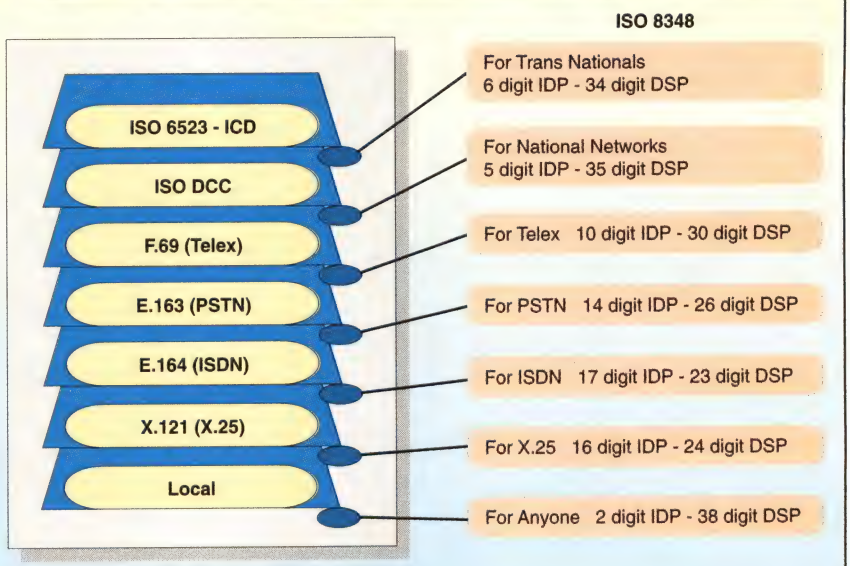
The Network Service Access Point is designed to uniquely identify, on a global basis, a network point within a single end system. An OSI NSAP address is used to address Transport entities located at the boundary of the underlying network services. NSAP addresses are logically distinct from routing information as the NSAP defines the network end points whereas routing information determines the path to the endpoint. Routing information can also be used to determine redundant and optimum paths between the network end points.

Figure 2 on this page shows the various types of NSAP defined by OSI. The International Code Designator (ICD) and Data Country Code (DCC) formats are used for network independent formats. Other formats are used for network dependent addresses such as the PSTN, ISDN and X.25 (X.121) addressing schemes.

In the diagram, IDP is the Initial Domain Part and DSP the Domain Specific Part. These address format fields are specified in ISO 8348.

The Network Service Access Point permits a 40 digit code to be used, whereas the standard network address forms, such as X.121 used by the X.25 protocol, only permit a 15 digit form. The 20 byte format has been defined to enable sufficient space for the global allocation of addresses and also the ability to embed network dependent and the in-machine addressing schemes currently in widespread use.

Figure 2: Network Addressing

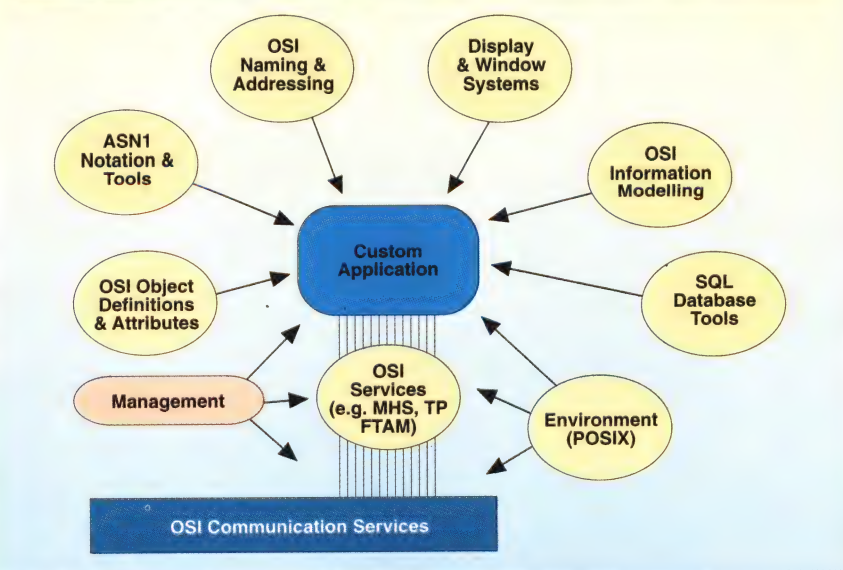


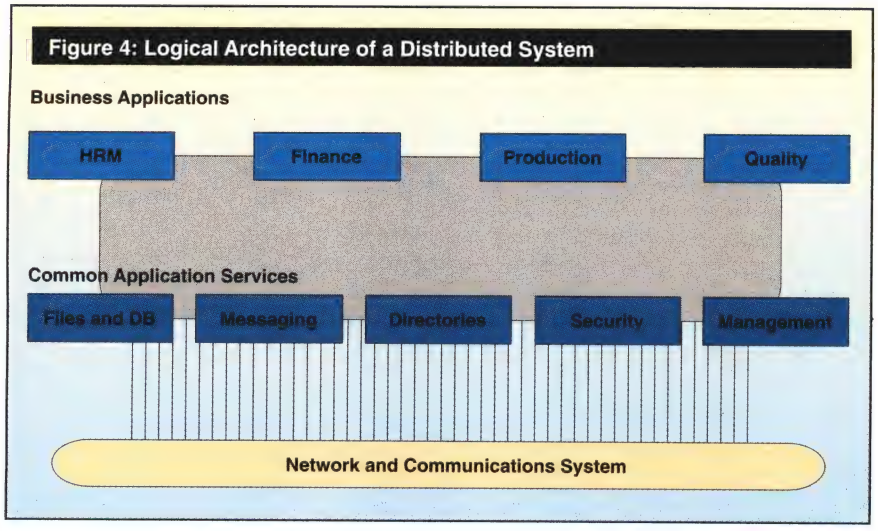
What is important is that network independent schemes are also provided by OSI. These schemes enable a network to be designed without relying on specific network or communications technologies. Networks are typically built on network dependent technologies such as X.25, which uses a dependent addressing scheme. DTE/end systems associated with X.25 are therefore designed with X.25's addressing scheme.

In the case of network independent address schemes, DTE/end systems are designed with independent addresses that could relate to any organisation, be it commercial, government or defence. These independent addressing schemes permit communication between end systems via a range of networking and communications technologies that can be selected on a cost, throughput and connectivity basis. It is the function of the end system and interworking units to map the network independent addresses on to the network dependent addresses for network protocol selection and transmission. Independent addresses are transported in the higher internetworking protocols, such as Internet IP and the ISO ConnectionLess Network Protocol (CLNP).

An analogy of network independent addressing is the postal address on a parcel. While the parcel can travel by road, rail or air to the destination, the sender and receiver address is independent of the transport between them. The benefit of this network

Figure 3: OSI Application Design





independence is that the carriage between two end points can be dynamically selected on grade of service and cost. With competition in carrier networks and services, this selection capability is imperative.

So what does this addressing issue really mean to the brand new network system being deployed? In general, it's that:

- The protocol profiles used have to support dependent and independent addressing schemes. It means an internetworking protocol is usually required to operate over a network dependent protocol (e.g. CLNP over X.25, ISDN or LANs);
- Network equipment has to support address mapping and the necessary protocol profiles;
- The network independent address codes used for your organisation have to be registered with the appropriate authority; and
- The communications sub-network infrastructure must support gateways between the respective ISDN, X.25, and local area network technologies.

All this, and it's only a network address!

Application Development

Application design and maintenance in large organisations is seen as an ongoing investment in the business. And the time and resources taken to generate such applications in traditional systems have always been seen as a normal aspect of the business. As development costs escalate and technology and business change marches on, constant reviews are required to maintain and enhance these developed applications.

In some organisations, application development and maintenance accounts for millions of dollars. The major design criteria for such applications has generally been to accommodate the particular architecture of the incumbent supplier. Most of the current applications are strongly tied to a proprietary system and are not readily ported.

This situation usually needs specialised skills for support and may involve supplier lock-in. It is a highly undesirable situation and one that is increasingly expensive, particularly when major suppliers are evolving towards open systems and reducing their proprietary skill base.

With OSI and open application standards there are now many components that can serve and support the customised part of an application. These services provide — via Application Program Interfaces (APIs) — database access, messaging, file management, window display systems, communications interfaces, data management, naming and addressing schemes, protocol generators, and so on (see Figure 3 on page 47).

The use of such services (which can now be purchased as ready made and tested API products) gives a 'tool box' approach to application development. Being OSI and open, it provides a high degree of portability and future proofing of the always expensive development investment.

When OSI and open platforms are used in conjunction with application design and development, it will significantly reduce the development time and total life cycle costs of the system. OSI API products are being released by the majority of vendors to support this development process. It is wrong to be developing applications that will use OSI distributed communications, without using the concepts, tools and functions associated with OSI and open platforms.

There is a certain amount of fear associated with application redevelopment for OSI and open platforms. Some organisations use applications which have grown and evolved over the years and their failure for an extended period can mean a severe loss. Support for these applications (and in some cases the associated documentation) is often long gone. The thought of touching such an application time bomb is often considered as something to be done only when one is as far away as possible!

As vendors move into the standards-based world and rationalise, such applications will be more and more on their own. They will become the business liability. From a planning and business risk perspective every proprietary (home grown) application should be assessed for their:

- Level of support and maintenance;
- Level of design documentation;
- Level of business risk if application failure occurs;
- Embedded proprietary functions which are being standardised, such as messaging, SQL and terminal management;
- Anticipated lifetime and lifetime cost;
- Suitability to changing business needs;
- Overall architecture; and
- The feasibility of redevelopment or application migration.

An example of a typical network that uses server-based services is illustrated in Figure 4. At the top of the diagram are the end user business applications such as finance, human resource management, production and the business' quality system. In a distributed environment they will use file, database, messaging, directory and security services of the common system functions below. The management system function can also perform local control and management information collection for both the applications and the common services.

Below this application level are the network and communications services which also interface to the management system hierarchy. The diagram shows that in a real distributed environment, applications and functions have to interwork. The references that permit interworking are the naming and addressing schemes. What services the distributed applications can interwork with are dependent on the architecture and administration of the total system and where common services are used. The applications themselves also have to be designed with these 'interfaces' built in. The signalling and control across these interfaces will contain the configured names and addresses of the network and applications that receive and provide services.

Emphasis Change Needed

When designing applications for a distributed environment, the interfaces and communications to the functions they interact with (naming and addressing schemes) must be built in. The new Remote Procedure Call mechanisms being developed today are evolving to provide this type of distributed application interface, but the fundamental issue of names and addresses seems to remain under cover or are allocated with proprietary schemes.

Hopefully this emphasis will change as the requirement for internationally standardised schemes is recognised. Paying attention to the naming and addressing issue from a business and system perspective should reduce the 'distributed' problems of implementing today's distributed technology.

Alan Lloyd

No matter what your telecommunications needs, you must look at the bottom line.

No matter what type or size of business you are in, the options offered by the telecommunications industry can work to make it more efficient, effective and profitable.

But with options come questions. Questions that can only be answered at ATUG '93. The complete showcase of what's new and what's happening in telecommunications from hundreds of different suppliers.

It makes ATUG '93 the only way to make the right decisions, choose the right options and connect with the right suppliers. Make it your business to be there.

For conference details and registration, call **(02) 965 4243.**

10th Australian Telecommunications Exhibition & Conference.
Darling Harbour, Sydney, Australia.
May 11-13 1993.
Open 9am-6pm Daily.

RIDDELL EXHIBITION PROMOTIONS PTY LTD

FREE ADMISSION TO BUSINESS PEOPLE
Riddell House 135-141 Burnley St. Richmond. 3121.
On behalf of the Australian Telecommunications Users Group.

Avoid queues. Fax this form before 23/4/93 to preregister.
Your admission Badge will be mailed to you.
Riddell Exhibition Promotions. Fax Melb (03) 427 0829 Syd (02) 550 4345

COMPETITION IN ACTION

People under the age of 18 years not admitted.

Name _____
Company _____
Industry _____ Title _____
Address _____
_____ P/Code _____
Phone: (____) _____ Fax (____) _____

ATUG '93
10th Australian Telecommunications Exhibition & Conference

MF/1642/REP

Applications

Telecom Puts its Routers to the Test

Savings of $50 million per year by getting the corporate network into shape. That's what Telecom's Information Technology Group (ITG) reckons it will be racking up by the third year of operation of its new Corporate Data Network (CDN). Now about 18 months into construction, it has already saved the company about $15 million on an annualised basis.

Big savings — but then it's a big network, interconnecting 700 LANs with 1,200 Novell servers formerly fragmented across 26 WANs (27 if you count OTC), many of which were duplicated and built to different standards with numerous base technologies, protocols and applications.

The CDN is a product of competition, the company's answer to Optus' much-vaunted Operational Support System (OSS). Like Optus' OSS, Telecom's CDN is a crucially important tool in the customer service race. It will allow anyone in Telecom to access information from any other computer resource, regardless of where or on what platform that information resides.

At the figuring-out-what-to-do stage on its formation in 1990, the ITG investigated other networks around the world for a lead on how best to integrate all the existing nets into one universal access network for both LAN-to-LAN and LAN-to-host connectivity. According to Wayne Knight, Telecom's Manager CDN-B Data Networks, they couldn't find any other company that had "bitten the bullet and tried to rationalise a company the size of Telecom so that it had a single corporate network."

Two Component Networks

The CDN is essentially an architecture that encompasses different technologies to provide a kind of utility service. It fits within the umbrella of Telecom's Overall Systems Architecture (OSA), described as 'a framework for the development and delivery of information systems within Telecom.' And there is also a Standard Operating Environment (SOE) which dictates that Ethernet media access will be via 10Base-T standards for cabling and equipment connections; that the LAN operating system will be Novell NetWare 3.11; it will be structured around manageable hubs; and that PCs, PC software, LAN cards, and file servers will be purchased 'as per current SOE contracts.'

The CDN has two component networks — a switched X.25 Austpac-based network (CDN-S) and a routed TCP/IP and IPX backbone network (CDN-B). Both will provide universal access; which one you operate from depends on which site you are at.

The CDN-S is a low-speed, low-cost network so, typically, users on smaller or remote LANs will be connected to the switched element of the CDN. Right now it is providing LAN to key corporate mainframe (Bull and IBM systems) access.

LANs are in the process of being standardised to NetWare 3.11. PCs run terminal emulation, typically Drift, which is a Telecom-designed and developed software package that allows concurrent access to up to nine disparate mainframe systems. Eicon gateways are attached to LANs so, when users on CDN-S want to establish a mainframe session, they call up an emulation and set up a virtual circuit out through Austpac (2.4 to 48Kbps) to the respective mainframe.

The other half of the CDN — the CDN-B — is a centrally controlled IP (Internet Protocol) and IPX (Novell's LAN protocol) network for high speed, high volume traffic. From its worldwide search for solutions in similar environments, Telecom believes the CDN-B is one of the five largest and most complex backbone nets in the world: one of the largest because LANs with over 25,000 PCs, 15,000 host-based terminals, 500 Unix workstations and 1,200 file servers connect to the CDN-B via dedicated links of between 48Kbps and 2Mbps; one of the most complex because Telecom opted for central management and, therefore, global connectivity, neither of which is normally associated with nets carrying a predominance of IPX traffic.

The IPX Challenge

Because it was designed as a LAN protocol IPX has a flat routing architecture. By contrast, IP can have a hierarchical addressing scheme where a network is broken up into sub-networks. Packets can get to any device in the network without carrying masses of addressing information — they just need the name or address of the target device, and the users' local router looks after the delivery of the packet to the destination. In Telecom, the links themselves and the routing hubs, or major network nodes (two in Victoria and NSW, and one in each of the other States), have B-class IP addresses.

But because IPX is flat, it needs to know where every device is, which is fine on a local network but not when you have 1,200 file servers. Historically, large IPX networks are heavily filtered to reduce the information flowing around the network, but the trade-off is a massive management overhead associated with maintaining those filters.

Therein lay the conundrum. Not filtering the IPX address packets — RIP (routing information protocol and SAP (service advertising protocol) packets — stresses routers to the extent that they drop packets: but complex and fragmented management could eat away at the efficiencies to be gained from central network management. The solution, according to Knight, was critically dependent on selecting the right routers.

He explains that in October 1992, the ITG carried out a series of very specific tests to ascertain how various routers behaved when RIP and SAP packets were broadcast around the network. Each minute, each router updates its RIP and SAP tables. That's okay, points out Knight, in a LAN environment with maybe 100 devices, but when you have thousands of devices operating across the wide area, there is a lot of traffic. "What we found in our network," he says, "is that because the RIP and SAP is so big from all the IPXs on the unfiltered network, often boxes would stop routing for 30 seconds or so, so performance was really bad."

Knight is reluctant to mention brand names and outcomes of the tests but, basically, Network Systems won out over the other vendors. Network Systems and the high end Cisco Systems routers have multiprocessor architectures — CPUs to route the data and CPUs for housekeeping functions so boxes don't get stressed. Network Systems though, also had the ability to directly connect host channels.

There are around 200 to 250 Network Systems Series 6000DX routers currently installed at customer and hub sites, and it is predicted that there will be about 350 by mid-93. A site typically has a Network Systems router and then a serial link connecting it to one of the hub sites. The CDN-B has been designed so that any piece of equipment can fail without affecting connectivity to the rest of the network so, if a site is considered critical, it will have multiple routers and multiple links.

At the hubs, a number of Network Systems routers are linked in an FDDI ring with at least two of the boxes having WAN connections to other hub points. There are also about 40 Cisco routers deployed for protocol conversion to get into the Bull mainframes and to connect across to the CDN-S; and in the inherited 26 WANs there are routers from Cisco, Wellfleet and 3Com.

The Telecom-Network Systems relationship dates back 10 years, to when the two companies and project manager Techway Networks installed a Hyper-channel-based network to connect disparate hosts and sites throughout Telecom. Techway Networks and Network Systems have an even closer association of 14 years standing, and the relationship between the three was recently formalised with a partnership agreement.

As Knight says: "We have found that with what we are doing we have to work extremely closely with router vendors, and this partnership agreement is to facilitate that. What we are trying to do is, at this point in time, uncommon by world standards. The CDN, even though it might consist of different technologies, is a single set of standards that enables us to deliver the data communications services that will fit the enterprise requirements."

Shelley Spriggs

Eicon Takes Aim at Remote Sites

Eicon's Interconnect Server simplifies remote routing and allows consolidation of LAN and 3270 links.

When it comes to routers for remote offices, the choices have been pretty limited: Either buy pricey standalone boxes that are tricky to install or opt for cheaper PC-based routers that offer only limited functionality. Eicon Technology says its Interconnect Server (ICS) does better than either choice. The ICS not only functions as a full-featured router but also adds IBM mainframe and minicomputer gateway capabilities — all in a card and software package that costs around $5,000.

Now being beta-tested by Telecom's Information Technology Group (ITG), the ICS has (or will have) many of the SNA internetworking functions of high end routers, Eicon says. As a result, net managers can save money by consolidating separate LAN and IBM 3270 communications links at remote offices. Telecom ITG now has around 1,500 Eicon gateways in place as part of its Standard Operating Environment. Wayne Gibbons, Manager of the carrier's (Switched) Corporate Data Network, confirmed that it will allow for the rationalisation of gateways on Telecom ITG's network.

Because it's intended for use in small remote offices, the ICS runs on an existing file server; there is no need to buy separate equipment for wide area access. The product comprises software and an Eiconcard communications controller, both of which are added to the server. (The ICS can also be installed inside an existing communications server.) Besides offering a wide range of functions, the ICS has a user interface that's easily recognisable to LAN administrators used to working with NetWare and other servers. Future versions of the ICS will support IBM's LAN Server, Microsoft's Windows NT, and Unix, Eicon says.

The ICS software is an NLM (NetWare Loadable Module), so most LAN managers will be familiar with its interface. With Telecom ITG a major Novell user, Gibbons describes this migration to the Novell platform as a "positive step."

The ICS forwards 600 packets per second (pps), which is slower than the 2,000-5,000 pps provided by access routers. However, Eicon says the slow WAN links connecting most remote sites negate any performance advantage of a standalone router.

At the heart of the ICS are its multiprotocol routing and gateway functions. It routes AppleTalk, IPX, and TCP/IP protocols, and exchanges 3270 and 5250 traffic with IBM mainframes and minicomputers.

ICS features are scheduled to be released in three phases. In its first phase, slated for availability next month, the ICS will run in either a file or communications server. The Eicon ICS uses the point-to-point protocol (PPP) to ensure interoperability with other vendors' routers at the central site; within a year, Eicon plans to add support for OSPF and integrated IS-IS routing protocols.

The product can be managed by any SNMP management console running under Windows, such as the vendor's Eicon Network management console. Net management of the ICS can be carried out either from a central office or locally at the remote site. In addition to SNMP, the ICS can be managed through IBM's NetView.

Phase Two of the product, planned for the fourth quarter this year, will add support for IBM's OS/2 Version 2.0. Two additional features will allow IBM terminal traffic to be sent over bridge and router networks. First, Eicon will include software that converts SDLC traffic into Token Ring LLC2 (Logical Link Control 2) frames for transmission over the LAN internet using remote Token Ring bridging. Second, the ICS will be able to take converted traffic from an IBM 3174 cluster controller and send it out over the internetwork along with LAN traffic, using a process called concentration.

A third phase, planned for the first half of 1994, will add Unix and Windows NT versions of the ICS. At this time, Eicon will offer additional SNA connectivity by implementing both Cisco Systems' SDLC encapsulation and IBM's Data Link Switching (DLS) for sending SNA traffic over TCP/IP internetworks. Future versions will support Cisco's APPI and the End Nodes designated under IBM's APPN. In addition, the ICS will support source route transparent (SRT) bridging.

In the wide area, the first-phase version of the ICS will support X.25 and SDLC leased-line links operating at 9.6 to 384-Kbps. It also will support frame relay and ISDN basic rate interfaces. Within the next two years, Eicon plans to support frame relay, primary rate ISDN, E1 and ATM.

Salvatore Salamone

PRODUCT SUMMARY

Name: Interconnect Server

Description: Remote access device combines the functions of a multiprotocol router, multiprotocol gateway, and an SNA concentrator/converter

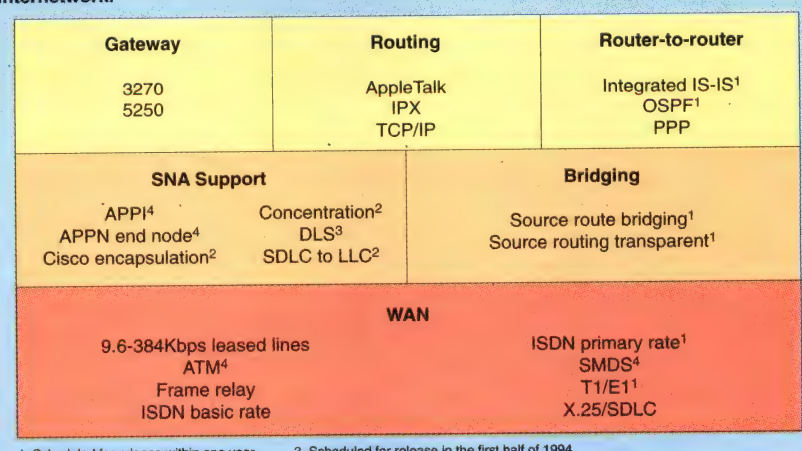
Price: Approximately $5,000

Vendor: Eicon Technology

Distributors: Com Tech, Unit 5, 37-41 Doody Street, Alexandria, NSW 2015. Tel: (02) 317 3088; JNA Network Services, 16 Smith Street, Chatswood, NSW 2067. Tel: (02) 417 6177

Combining LAN and SNA Connectivity

Eicon Technology's Interconnect Server combines router, gateway, and 3270 connectivity functions into one unit to send LAN and SNA traffic from remote sites onto a LAN internetwork.



1. Scheduled for release within one year
2. Scheduled for 4Q93 release
3. Scheduled for release in the first half of 1994
4. Scheduled for release within two years

Retix Ties Up Internetworking

Retix boosts its internetworking credentials with two new RX 7000 routers and 10Base-T hub cards.

When one thinks of bridges and routers in Australia Retix is not the first name to spring to mind. This is probably because the company does not have the sort of brass band and fireworks approach to marketing which is all too common to the network industry — instead, it does things like send broad technical data on products with press releases. The company also has staff who say things like 'I don't know, but I'll find out' (which they mean) when you ask them a question regarding that technical information.

Retix has been in business since 1985 and quietly selling product in Australia for roughly two years. Currently 60% of the company's market is outside the US and half of that export market is in Europe. The company has a fully justified reputation for producing solid, reliable and interoperable bridges and routers. It was one of the first US-based companies to recognise that in most of the world, data communications doesn't necessarily have to mean point-to-point leased lines and that X.25 was not just a way of multiplexing serial connections over a T1 link.

Retix is also active in the OSI arena — in fact it has licensed its technology to a respectable chunk of the computer and telecommunications industry. This fact, and its European operations, just might result in it becoming one of the first companies to make any real money out of OSI.

Retix released its RouterXchange 7000 family last year. The RX 7000 is intended as a solid, dependable high end platform which will live in your rack mount cabinet, and be easily serviced, reconfigured and upgraded while providing excellent performance for years. This RX 7000 family has now been expanded with the addition of the model 7550, a dual power supply version of the 7500; and the 7250, a low end unit intended for use as a 'feeder' in remote offices (for example).

The RX 7000 family is based on Intel's i960 RISC processor and uses Retix's dual processor architecture which divides the processing load between a Routing Management Processor (RMP) and one or more Forwarding Processors (FPs). The RMP's i960 handles all the computing required by a variety of routing and bridging algorithms and constructs global tables from which each FP is periodically updated. The RMP's processor is also responsible for system management, including a local SNMP agent.

Each FP has an i960 processor which is dedicated to actually bridging and routing incoming data. Each chassis requires one RMP and at least one FP. Each FP can support up to three interface modules which may be any mix of thick or thin Ethernet, Token Ring (4 or 16Mbps), serial interfaces (X.21, V.35 or RS-449) and ATM.

To coincide with the release of the RX 7550 and RX 7250, Retix has released two 10Base-T interface modules, the 10BT-1 (single port RJ-45) and the 10BT-12 which provides 12 ports and is accessed via an SCSI-2 to 50-pin Telco cable, which in turn connects to a standard 12 port RJ-45 'harmonica.' Each 10BT-12 is thus equivalent to a concentrator attached to one port of a bridge/router (the FP). Dedicated FDDI FPs which provide DAS (FDDI-7715) or SAS (FDDI-7716) connections are also available.

The 75xx chassis has 5 slots and so can support up to three FPs and up to 12 interface modules, while the 7250 chassis has two slots and so supports only one FP and up to three interface modules. Retix markets the RX 7520 as a bundle which includes the chassis, an RMP and an FP. You then purchase interface modules as required. The RX 75xx units are marketed as individual components.

In addition to hot swap modules and implementation of the IEEE 802.1 spanning tree algorithm the RX 7xxx family provides V.42*bis* compliant transparent data compression which Retix claims can increase link capacity by up to 200%. Unfortunately, while this standard is in use internationally — by BT for example — few vendors in the Australian market implement it, so Retix's data compression must be considered as effectively proprietary. Retix has also implemented V.54 loopback and bit error rate testing (BERT) as a part of its standard diagnostic suite. Self diagnostics run automatically on power-up, reboot or module insertion. Diagnostic and system messages are displayed on a front panel LCD.

As with other Retix products the RX 7xxx units are managed via NetLabs/Manager, SunNet Manager, HP Openview or via any SNMP MIB II compatible management application, within the bounds of the standard MIB. Management and configuration is also possible via a terminal connected directly to an RMP, via a dial-in connection to the RMP's serial port or a Telnet session from any workstation. Management stations can also set a variety of filters such as MAC address, packet type, route address, protocol address or custom filters such as bit-mask, SAP and broadcast.

The RX 7xxx supports TCP/IP, IPX/SPX and DECnet Phase IV protocols. In the WAN environment CCITT X.21 at up to 2.048Mbps (full duplex, external clock), V.35 at 48Kbps to 2.048Mbps (full duplex, external clock), RS-449 at 48Kbps to 2.048-Mbps (full duplex, external clock), X.25 and frame relay are supported along with PPP, HDLC, LAPB, LAPF and Retix's proprietary encapsulation protocols.

My only, very minor, gripe with the RX 7xxx series is the current lack of a fibre Ethernet interface. However, since the 10Base-5 interface module uses a standard AUI port, an external fibre transceiver can be used, although this introduces a couple more points of failure to the connection. The addition of a 10Base-F or a FOIRL interface module would make the RX 7500 a much more cost effective solution in, for example, a campus site which could not justify the expense of an FDDI installation. It would also allow the RX 7250, which does not have sufficient slots to support FDDI, to be used in such installations.

In its intended market, which is smaller remote sites, the 7250's combination of bridge/router and hub along with data compression capability, to squeeze higher performance out of lower bandwidth lines, makes it a strong option. The unit's excellent diagnostics, in-band and out-band management capability and choice of WAN interfaces don't hurt either.

Graeme Le Roux

PRODUCT SUMMARY

Name: RX 7000 Model 7250; RX 7000 Model 7550; 10BT-1 10Base-T Hub Card; 10BT-12 10Base-T Hub Card

Description: High end routers designed to round out Retix's RX 7000 router family. 10Base-T hub cards support up to 12 Ethernet devices.

Price: Model 7250 (includes RMP & FP), from $9,405; Model 7550 (chassis & dual power supplies), approximately $5,700; RMP 7705 (one per 75xx chassis) $6,585; FP 7710 $4,705; 10BT-1 (single port) $1,130; 10BT-12 (12 port), approximately $2,900

Vendor: Retix Australia, 811 Warrigal Road, Oakleigh VIC 3166, Tel: (03) 563-4333

ATM Comes Out of the Ether

Newbridge Networks' Vivid provides a high speed backbone for existing LAN internetworks.

At some point, every new technology has to move from the future to the present. For ATM, that time is fast approaching, thanks to the arrival of products like Vivid from Newbridge Networks. Among the first crop of premises equipment to give users a practical way to apply ATM to existing LAN internetworks, Vivid's key advantage is that it provides both an ATM switching fabric and a way to connect equipment to that switching fabric, according to John Carosella, Director of Product Management at Newbridge.

With Vivid's three main components — ATM switching hubs, access switches, and routing software — network managers can create ATM backbones that can carry Ethernet and Token Ring traffic. Existing ATM premises switches from vendors like Adaptive and Fore Systems can be used to create ATM-only LANs, but they offer no connections to Ethernet or Token Ring nets. Other vendors, including Stratacom and Cabletron, are developing products that integrate ATM with existing internetworks, but those aren't scheduled for release until next year.

Vivid's ATM hubs can switch traffic at up to 10Gbps; as many as 16 hubs can be interconnected in an ATM backbone. Ethernet and Token Ring LANs connect to this backbone via access switches — Newbridge calls them Ridges — that convert LAN packets to ATM cells and vice versa. Each hub has 16 ports for connecting to Ridges, individual LAN segments, or other hubs. Each Ethernet Ridge can accommodate up to 12 Ethernet segments; each Token Ring Ridge can handle up to eight Token Ring segments.

Ridges also work with Vivid's Route Server (RS) software to deal with routing chores. RS software is distributed throughout the network on various computing platforms, such as PCs and workstations. These Route Server stations serve as the 'brains' of the network, keeping track of hubs and Ridges and dynamically calculating optimal network routes. RS stations provide this routing information to the Ridges, which perform the actual cell switching.

When a Ridge is first connected to the network, it finds the nearest RS station and provides it with information about both its location and the LANs, switches, and other Ridges it's connected to. To set up a connection between two internetworked LANs, the Route Server station maps the media access control (MAC) addresses of the LAN packets to the ATM virtual circuit and virtual path identifiers, and then downloads this information to the Ridge for switching.

The separation of the route calculation and switching functions makes for more efficient performance, according to Carosella. Conventional routers have to perform two basic tasks — they have to figure out where the data has to go, and then they have to move it there. Free of the burden of switching, RS software can calculate routes much faster than conventional routers, he says.

Because RS software does nothing but calculate paths, routes can be calculated dynamically, making it easier to accommodate changes to the network. Whenever a user is added to, or deleted from, a location, the network automatically reconfigures, without requiring the network manager to enter address changes manually. According to Carosella, Newbridge included dynamic reconfiguration with an eye toward accommodating the expected surge in the use of mobile wireless stations.

In addition to ATM hubs, Ridges, and RS software, Vivid has a fourth component — LAN Service Units — which link to Ridges via Ethernet and Token Ring interfaces and act as a combination wiring hub and bridge for Ethernet and Token Ring segments. They provide local filtering, frame forwarding, and concentration for attached segments.

Johna Till Johnson

PRODUCT SUMMARY

Name: Vivid

Description: Premises ATM backbone including hubs, Route Server software, LAN Service Units, and access switches (Ridges) for routing traffic among existing Ethernet or Token Ring LAN segments

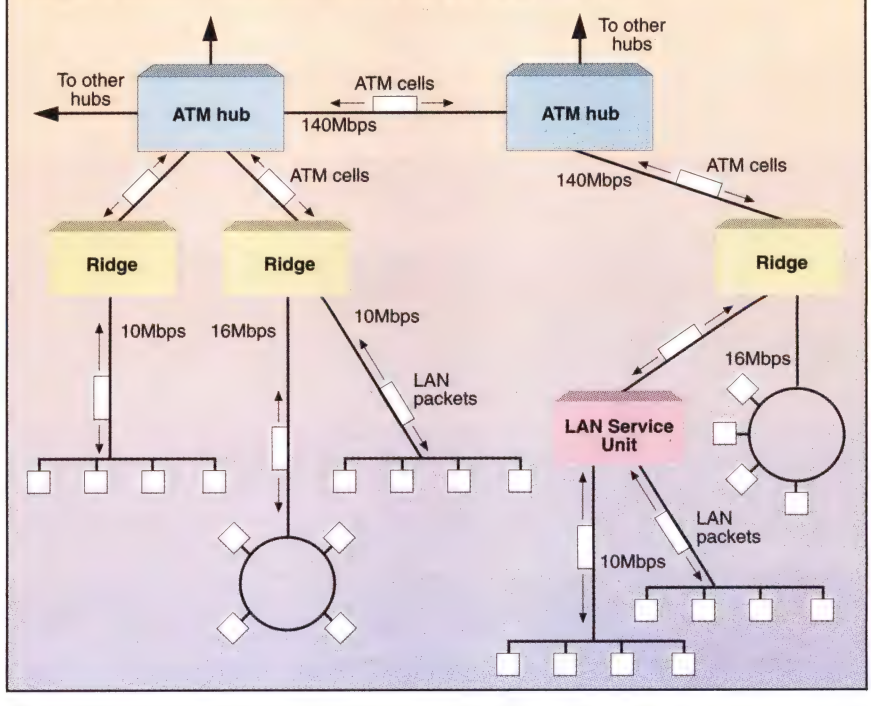
Vendor: Newbridge Networks

Distributor: Datacraft, 266 Maroondah Highway, Mooroolbark, VIC 3138. Contact: Tony Wise; Tel: (03) 727 9111

Availability: ATM hubs and Ethernet LAN Service Units — October; Ethernet access switches — Q1 1994; Route Server software and Token Ring Access switches — Q2 1994; Token Ring LAN Service Units — mid-1994

A Vivid Approach to High Speed Internetworking

NewBridge Networks' Vivid hardware includes ATM hubs, access switches (Ridges), and LAN Service Units. Router Server software residing thoughout the internetwork works with Ridges to provide dynamic routing of Ethernet and Token Ring traffic.



What you really want is a solution...

Insist on AT&T SYSTIMAX® PDS Category 5 End-to End connectivity from a single manufacturer... Let allNET Technologies connect you with AT&T.

Tomorrow's technology today.

allNET Technologies

allNET Technologies Pty Ltd
Unit 8, 3 Gibbes Street, Chatswood, NSW 2067
Telephone (02) 417 4800 Facsimile (02) 417 2281

AT&T Authorized Distributor
SYSTIMAX Premises Distribution System

Microwaves and Megastorms

Despite the flurry of excitement earlier this year, Pay TV is still no closer to becoming a reality. Peter Leonard charts the course of MDS Pay TV policy through political storms and legal challenges.

Given the history of Pay TV policy in Australia, it was inevitable that the tender for microwave multi-point distribution systems (MDS) radiocommunications licences suitable for video service delivery would excite considerable interest. However, few people expected the tender would end in a mire of litigation. This *Legal Line* takes a look at the process which lead to the courts and the progress of the Stokes and Cosser claims.

A potential provider of Pay TV services in Australia using microwave MDS delivery will require two licences: a licence for relevant frequency under the *Radiocommunications Act 1983* issued by the Minister (which is also sometimes referred to as a technical licence); and a subscription television broadcasting service licence issued under the *Broadcasting Services Act 1992* by the Australian Broadcasting Authority (ABA).

The *Broadcasting Services Act* does not limit the number of service licences that may be issued by the ABA, other than by setting limits on the number of satellite service licences. The only precondition to issue of non-satellite licences is that the ABA must request the Trade Practices Commission to provide a report to the effect that allocation of the licence would not have the effect, or be likely to have the effect, of substantially lessening competition in a market. This will require the TPC to determine the appropriate 'market.' However, the ABA does not have a role in regulating or controlling the number of participants in the Pay TV market — unless the Minister is allowed by the Act to direct the ABA as to the number or type of Pay TV licences which may be issued.

Technical Licences

Spectrum constraints limit the number of technical licences in the MDS band to 19. There is no limitation imposed in the Act itself on the number of service licences that could be issued by the ABA. However, limitations currently apply by virtue of directions of 28 and 29 January 1993 issued by Senator Bob Collins. These directions are at the heart of the challenge in the Cosser proceedings.

Technical licences are issued for the use of specified channels within the band. On previous Government policy new technical licences issued in the MDS band will not limit the use made of a licensed channel in the MDS band; new technical licences will not prevent use for provision of a Pay TV service; and as and when digital compression becomes available, a channel could be used for more than one Pay TV service. However, Government policy, as set out in the Minister's directions, would preclude issue by the ABA of service licences permitting primary provision of Pay TV.

Current technical licences in the MDS band are subject to limitations (imposed by licence conditions and by incorporation by reference of Ministerial Guidelines known as the VAEIS Guidelines, which prevent use of these licensed channels to provide a Pay TV service). However, the Minister has power to revoke both these licence conditions and the VAEIS Guidelines at any time, and could, by so doing, permit the use of currently licensed channels to transmit Pay TV (subject to issue of service licences by the ABA). The Minister was, prior to the policy reversal of 28 January, moving to revoke these restrictions, but the restrictions remain in place at this time. The Minister could remove these restrictions whenever the Minister saw fit.

MDS Licence Tender

By advertisements published in the national press on 9 December 1992, the Department of Transport and Communications (DOTAC) invited tenders for the price-based allocation of MDS licences 'to be used for any purposes specified in the MDS band plan, including for the terrestrial provision of narrowcast Pay TV.' The MDS band plan includes the purpose of transmission of services in the category 'entertainment video, including Pay TV.'

The Government proposed to assign between six (in Sydney and Melbourne) and 19 frequencies. Prior allocations (for example, the balance of 13 frequencies in Sydney and three in Canberra) had been taken up by services that were restricted by licence conditions to not provide Pay TV. These licensees are either not currently operating or are providing services in other categories (such as non-entertainment video). As noted above, the nature of services provided by these existing licensees could be changed to include Pay TV if the Minister approved appropriate amendments to the conditions attaching to the technical licences and the ABA granted

Pay TV service licences. The Invitation to Tender sought written bids no later than 29 January 1993. No reserve price was set for the tender. The Ministerial Determinations pursuant to which the tender was conducted stated that the successful bidder will be the bidder who submits the highest bid.

The Determinations did not in terms reserve any discretion to the Minister to refuse to issue a licence on completion of the bid and consideration of tenders.

In fact, the Determination said that an MDS licence 'will be granted' to the applicant who tenders the highest amount. These words sit most uncomfortably with the words in Section 24 — the section under which the Minister would in fact issue the licence. This section says the Minister 'may, in his or her discretion, grant' a licence. So is this discretion in some way limited by the Determinations? The Stokes proceedings have not yet answered this question.

By notice published in a *Special Gazette* of 29 January 1993, Mr Roger Beale (as the Secretary to the Department of Transport and Communications) purported to 'revoke' the request for tenders. Applicants for licences were subsequently advised by letter that the Minister had announced 'the Government's intention to defer the allocation of broadcast Pay TV licences using Multipoint Distribution Services (MDS). Accordingly, the invitations to tender for MDS licences previously published in the *Special Gazette* and the press have been revoked.' Applicants were advised that they should contact the Department to arrange for return of tender documents.

On 28 January 1993 the Minister notified the ABA of 'Government policy in relation to subscription television broadcasting services delivered by MDS systems.' This notification was revoked the next day and replaced with a further notification. The policy as stated in the notification is that: 'No licence should be issued for subscription television broadcasting services relying predominantly on MDS for delivery prior to: (a) the award of licences for satellite Pay TV services and the determination of the digital transmission standard for satellite subscription television broadcasting services; or (b) a subscription television broadcasting service by cable being licensed and being in a position to operation nationally, whichever is the earlier.'

The notification continued: '[Government policy] will not prevent the continued use and development of MDS for narrowcasting services or the progressive development of cable services. In time it will allow for MDS to play its proper role as an ancillary competitor for satellite and cable subscription television services.'

The Minister on the same day directed the ABA 'under Section 162 of the Act to act in accordance with the policies set out in the revised instrument under Section 161 when performing its functions under the Act, including when considering the exercise of its power under Section 96 of the Act [to issue Pay TV service licences to any applicant].'

Stokes Proceedings

Australian Capital Equity (ACE) lodged a tender for the issue of 22 MDS licences in response to the Invitation to Tender.

Following receipt of the Minister's purported revocation of the Invitation to Tender, ACE sought orders from the Federal Court in Perth directing the Minister to determine the tenders in accordance with the procedures set out in the determination. By consent, an interim order was made that no step was to be taken by the Minister or the Commonwealth to give effect to the purported termination of the tender process until further order of the Court.

ACE and the Commonwealth agreed that the matter would first go to hearing on a preliminary question as to the statutory power of the Minister or his delegate to revoke the Invitation to Tender. This issue was heard in Perth on 2 March. In what many see as a surprising decision, Mr Justice Lee on 18 March 1993 determined this issue in favour of ACE.

Mr Justice Lee's judgment noted that neither the terms of the Act nor the determination provided an implied power to the Commonwealth to revoke the Invitation to Tender. It was therefore necessary to determine whether the Commonwealth could rely upon Section 33(3) of the Acts Interpretation Act 1901 ('Interpretation Act'), either of its own operation or in combination with Section 46(a) of that Act, to imply a power to revoke the Invitation to Tender.

Mr Justice Lee concluded that for subsection 3(3) to apply 'an instrument must be a document of a legislative character.' The tender did not have this character: 'The dissemination of information by way of a notice in the *Gazette* to the effect that tenders for MDS licences are invited suggests the exercise of an administrative or executive power. It lacks the capacity to affect rights and obligations. It has no character equivalent to a promulgation binding in nature such as the notification of standards or guidelines, directions or orders. Furthermore, it has no continuing effect such as would render it appropriate for revocation.'

In the alternative, the judge concluded that if he was wrong and the Invitation to Tender created rights and was therefore in the nature of a legislative instrument, it was not contemplated by the *Radiocommunications Act* that such rights would be subject to revocation and treatment in a manner inconsistent with other provisions of the Act.

The judge noted that other provisions of the Act made explicit provision for review and revocation of various decisions of the Minister and exercises of the powers conferred by the Act and, in a number of those provisions, provided for representations to be invited, received and considered before these powers are exercised. This suggested that the Parliament did not intend the power conferred on the Minister under Section 92A (to allocate licences based on a price-based allocation system) to be used in a manner inconsistent with the comprehensive provisions contained throughout the Act in respect of rights affected by the exercise of powers delegated by the Act.

As an aside, the judge noted that it may be argued that it could not have been intended by Section 92A that the power conferred on the Minister to determine a price based allocation system could be used to fetter the exercise of his power to issue technical licences under Section 24 indefinitely. In the absence of any restriction on the latter discretion, tenders submitted in support of an application for a licence would have to be dealt with as and when received and decisions made upon them accordingly. (This leaves open the possibility of an applicant for a licence seeking Administrative Appeal Tribunal review (on the merits) of any refusal by the Minister to issue a technical licence.)

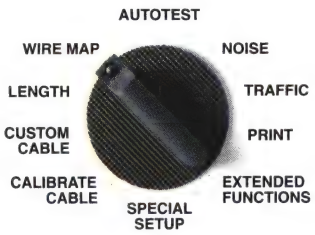
The judge of a subsequent hearing as to the appropriate form of relief said that the only relief that might be appropriate was a declaration that the revocation of the Invitation to Tender was not taken pursuant to statutory authority. ACE was directed to file its suggested form of declaration on 1 April and the Commonwealth to reply on 2 April. The matter was then adjourned for further argument on 7 April 1993.

ACE is likely to file draft directions which include orders that the Commonwealth:

- Proceed to determine all tenders received in response to the invitation to tender in accordance with the procedures set out in the determination; and
- Award MDS licences to those persons who tendered the highest amount for the licences by sealed tender.

If such orders were granted, the effect would be to preclude the Commonwealth from requesting or receiving further tenders, including any further tenders lodged by persons such as Time Warner who had elected not to file an Invitation to Tender on 29 February after the announcement of revocation of the tender on 28 January.

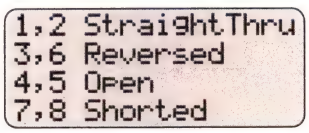
It is not clear whether the Government can now remedy the defect in revocation of the tender process without amendment to the Act (which of course requires passage of legislation through both Houses of Parliament) or making of regulations under the Act (which must be tabled in each House and which may be disallowed



Simply twist the rotary knob to select the function you need. It's easy, intuitive, and eliminates having to hassle with multi-level menus and complex keypads.

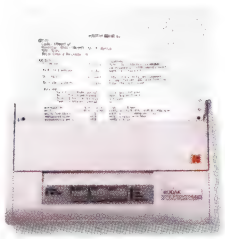
Click.

Beep.



In seconds, a beep alerts you to correct operation and pass/fail results. The sharp 64-character display gives you cable measurements automatically.

Installers can store and print up to 50 cable certification and test reports. Monitor Ethernet traffic activity and test for up to 99 hours, then print results via the serial printer port.



Whirr.

Wow!

New: 650 LAN CableMeter

The latest word in faster, easier cable testing and certification.

Identify your cable problems in seconds. Use Fluke's new 650 CableMeter to test standard or custom unshielded twisted pair and coaxial wiring in Ethernet, Token-Ring, and many other LANs.

Count up the features. You'll find this portable, versatile tool is indispensable for cable installation, or the ongoing maintenance of a network.

Count down the price. No other cable tester on the market today can match it for high performance and low cost.

Finally, count on Fluke, the leader in portable test and measurement tools since 1949, to support you with an excellent warranty and exceptional service. Pick up a 650 CableMeter today.

For full details contact your local Fluke distributor or call Philips Test and Measurement on (02) 888 0416

FLUKE®

What transfers more stock in a single day than a successful broker in an entire career? Ericsson Business Network.

Being able to communicate is of vital importance. Especially when you turn over millions of pounds every day. That's why the International Stock Exchange in London installed an Ericsson Business Network.

The Exchange needed a communications system that offered the best in efficiency, reliability and security.

Business Network answered all the Exchange's voice and data needs, providing the perfect solution for both now and in the future.

The Exchange's data network uses an Ericsson ERIPAX packet-switching system. Its administrative telephone system is co-ordinated through an Ericsson MD110 digital PABX.

Right now Ericsson are delivering similar solutions for a large number of Australian companies. So if you'd like a free Business Network information kit, call Ericsson.

*business*network

THE COMPLETE COMMUNICATIONS NETWORK

Vic (03) 480 4888 N.S.W (02) 805 4999 QLD (07) 262 6222
S.A (08) 234 5555 W.A (09) 262 6222 A.C.T (06) 257 1033
Tas (003) 31 2544 P.N.G (675) 25 6566 Sanford Vick 3062

ERICSSON

by either House — hence potentially disallowable in the Senate on combined vote of the Liberal/National Coalition and Democrats).

Of course, the Stokes proceedings relate only to the technical licences. Holders of any technical licences (who wish to provide Pay TV services) must obtain an appropriate service licence from the ABA.

Cosser Proceedings

The Cosser entity, Capacity Pty Limited, applied to the ABA for six service licences. As a result of the Minister's directions to the ABA of 29 January 1993, the ABA determined not to proceed to consider the application.

Capacity then instituted proceedings against the Minister and the ABA in the Federal Court in Sydney.

The challenge therefore turns upon whether the Minister's direction to the Australian Broadcasting Authority was validly given under the relevant provisions of the *Broadcasting Services Act 1992*. Specifically, Cosser alleged that:

- The directions were not validly given under Section 161 of that Act, as that Section only allowed the Minister to give directions to the ABA in relation to the general policies of Government and not particular policies in relation to the Act, and general policies encompassed topics such as equal opportunity, employment, anti-discrimination policies and the like, and not the policies referred to in the directions;
- The directions were not validly given under Section 162 of the Act, because that Section only allows directions to be given that are of a 'general nature' and not of a specific nature relating to provision of Pay TV services using MDS,
- Neither Section (161 or 162) allows the Minister 'to legislate for the postponement or alteration of the Act or any part thereof.'

The effect of preventing the ABA from granting Pay TV licences for MDS operators was to alter the Act by preventing the ABA from exercising a power that it would otherwise have.

Cosser also pleads the usual administrative law claims that the Minister took irrelevant considerations into account in the exercise of the power; that the Minister failed to take into account relevant considerations; that the Minister exercised the power for a purpose other than the purpose for which the power is conferred; that the Minister acted so unreasonably that no reasonable person could have so exercised the powers; and that the decisions involved an error of law or were contrary to law.

The matter was listed for hearing before Mr Justice Whitlam on all issues on 21 April 1993. It is be expected that the judge will reserve his decision, with the result that the outcome of the hearing may not be known as at the date now set for lodgment of satellite Pay TV licence tenders (28 April 1993).

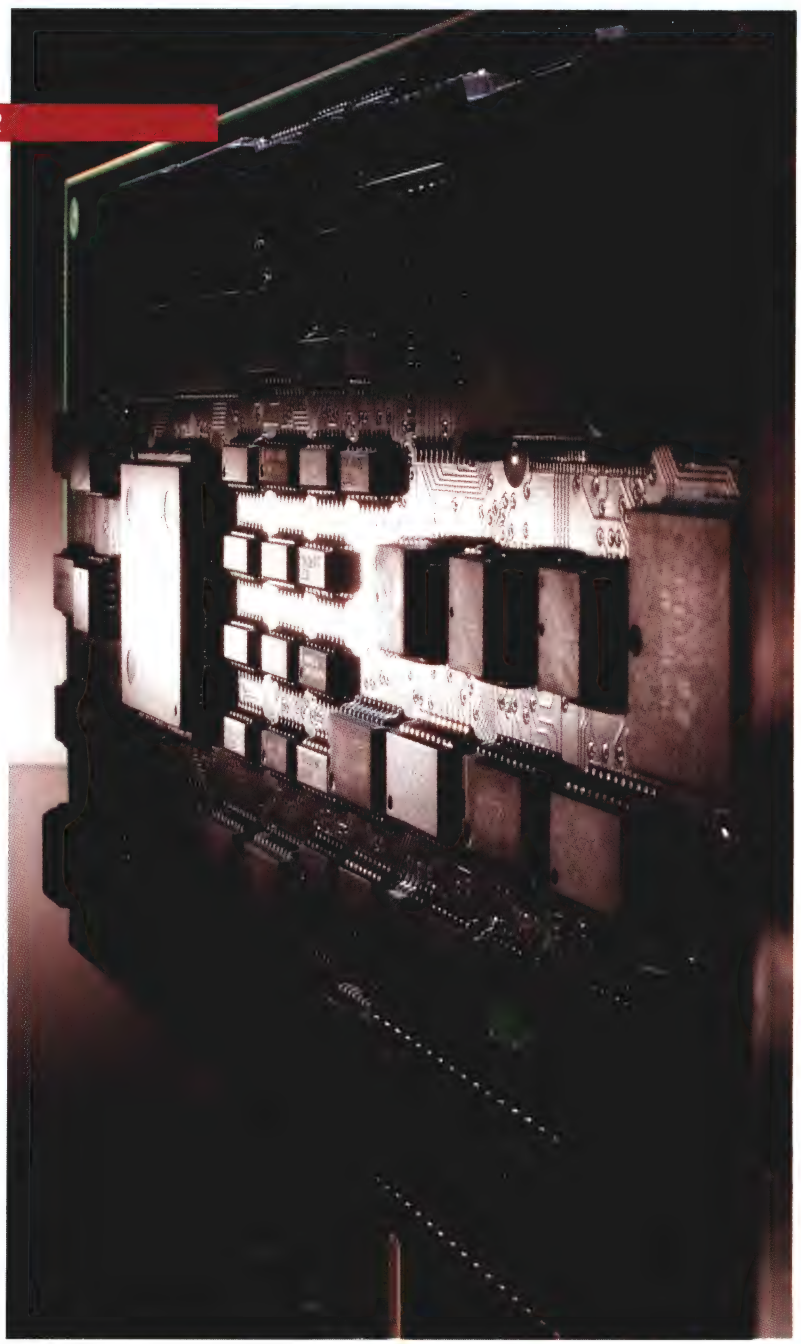
Conclusion

At the time of going to press, the final outcome in the Stokes and Cosser proceedings was not known. However, speculation was rife that the Government would introduce amending legislation to support the Government's amended policy of delaying use of MDS frequencies to provide Pay TV until at least the satellite Pay TV operators were selected. Given the history of Pay TV policy, it would not be surprising to see further policy 'clarifications' before the Stokes and Cosser proceedings are finally determined.

Peter Leonard is a partner with the technology law firm, Gilbert & Tobin and specialises in communications and information technology contracting and regulation. This column sets out his views and not those of clients of his firm.

WORLD'S FASTEST

EISA 16/4 SERVER ADAPTER



In fact, at frame sizes under 256 bytes, our new EISA Server Adapter is twice as fast as anything else around. Since most LAN traffic consists of small frames, our throughput is nothing short of astounding.

Running in DMA burst mode—using 32-bit data transfer on the EISA bus—the new Server Adapter has 512 Kbytes of on-board fast memory. You can even have up to eight adapters in a single PC.

Like all Olicom Token-Ring products, the adapter is fully IBM compatible and interoperable, and supports all major network operating systems.

Want better bus service? Call Olicom today.

olicom

TOKEN-RING SOLUTIONS

Australian Distributor for Olicom: FORCE TECHNOLOGY PTY LTD, P.O. Box 1516 · Dee Why, NSW 2099 · Ph: (02) 971 1000 · Fax: (02) 981 1932

Will PanAmSat's 'Truth and Technology' Triumph?

Fred Landman
President and COO, PanAmSat

As President and Chief Operating Officer of PanAmSat since its inception in 1984, Fred Landman has been at the forefront of breaking down regulatory barriers to establish the first private enterprise international satellite system separate from Intelsat. Following the success of the PAS-1 spacecraft in the Atlantic Ocean Region, he is now leading PanAmSat into the launch of three new high powered satellites to form a global system, with PAS-2 scheduled for service over the Pacific Ocean Region by mid-1994. He spoke with Liz Fell last month in Hong Kong after addressing the AIC Pan-Asia Cable and Satellite conference.

PanAmSat's challenge to Intelsat's monopoly has involved a struggle on a number of fronts. Many people were shocked years ago when your founder and Chairman, Rene Anselmo, referred to Intelsat as a 'monstrous worldwide telephone cartel.'

Landman: That was when he was being kind! The environment in the mid-80s when we started this venture was that Intelsat had convinced people that private international satellite systems would be the beginning of the end. But that tune is not singing very well now. We've been very successful competing in the Atlantic Ocean Region since 1988 and Intelsat, once they moved out of their paranoid stage, have continued to be successful.

AC: *The PanAmSat slogan: 'Truth and technology will triumph over bullshit and bureaucracy' must have helped get your message across?*

Landman: A lot of people have commented on that and our use of the dog Spot. Customers, not Intelsat signatories, but real customers have said that we are successful because Intelsat was so bad in the markets we were going after, they just weren't meeting market demand. If they were, we would have been out of business a long time ago.

AC: *So how does your approach differ from Intelsat's?*

Landman: The difference is our market focus and our customers. Intelsat have exclusive access to their system via signatories so their focus is on signatory requirements. Intelsat has no customers, it has users. We focus directly on customers, particularly broadcast and private corporate network customers. So we are competing with Intelsat from a satellite perspective, and with their PTT signatories from an operating customer perspective.

AC: *Was it a tough struggle to get satellite landing rights in each country?*

Landman: Yes, when we started, we were only authorised by Intelsat to provide service between the US and Peru. It took about three years to take that from one country to 70 countries, and from one customer to filling up the satellite with over 300 customers now.

AC: *As well as having to consult with Intelsat before starting a service, didn't the US Government impose restrictions under its separate satellite policy?*

Landman: When that whole policy was developed, the US Government bought into Intelsat's act. As our Chairman put it: 'The Mother Theresa of satellite services, Intelsat, would be so harmed by private satellite systems.' For God's sakes. Intelsat have 16 satellites, a multi-billion dollar organisation, and we had this scrappy start-up. We needed to be protected from them, not them from us!

AC: *But aren't you still subject to restrictions that protect Intelsat, such as limits on traffic interconnected to the public switched network?*

Landman: That sacrosanct policy has been eroding. The US Government at the end of 1991 said it was going to lift those restrictions and Intelsat has adopted that policy. The threshold has been lifted to 1,250 64 kilobit-equivalent circuits per satellite. By January 1997, there will be no prohibition on the type of traffic private satellite systems can carry.

AC: *As part of your struggle with Intelsat, you have also engaged in expensive legal battles. Has your anti-trust suit against Comsat [Intelsat's US signatory] finished?*

Landman: That's still going. The fat lady has not sung. It's a slow process and a complicated issue.

AC: *These cases must cost a lot of money?*

Landman: We're not talking about money. We're talking about right or wrong.

AC: *But surely you wouldn't fight the case if there weren't some revenue benefits?*

Landman: No. There was something very fundamental here. We had an organisation above the law that was controlling prices and trying to put competitors out of business. As a regular corporation they would never ever get away with that. The issue was why was Comsat above the law? What British Airways did to Virgin is tame compared to what they did to us. That's the principle we're going after. It's not about revenues.

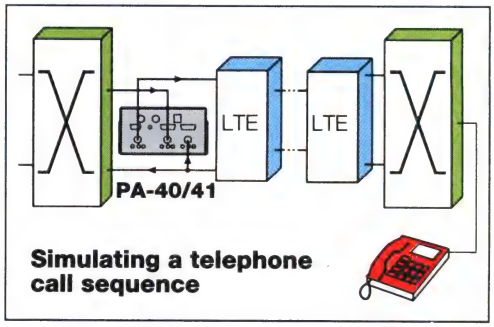
AC: *Much of your early success has been in Latin America. How did Intelsat respond?*

Landman: Their response, and I'm not saying they are still doing this today, but in the mid-1980s when we started, the first thing they did was to try to discredit us. When that didn't work, they started selling capacity at below cost to keep us out. There was one foray when they provided capacity at a fraction of what they had been charging. This cost them, by our estimation, about $US80 million. Basically they used every dirty trick in the book to keep us out. And when it was all over, we were still getting customers.

AC: *As a result of this competition, do you think Intelsat has lifted its game?*

Landman: I don't think the jury is in yet. There's been a lot of talk about becoming competitive and paying attention to ignored markets. But don't forget that Intelsat has been dominated by the North Atlantic alliance — the US, UK, France and Germany — that's where the big ownership is. I think

Simultaneous Bi-directional Frame & Signalling Analysis



PA-40 Frame Analyzer and PA-41 Frame/Signalling Analyzer are field service instruments designed for commissioning, maintaining and troubleshooting 2 Mbit/s circuits. They are combined frame and signalling analyzers and each instrument has two receivers (2Rx) allowing both directions of a 2 Mbit/s circuit to be monitored simultaneously. Each instrument also has one transmitter (1Tx).

PA-40 offers a wide range of applications, including:

- Framed monitoring in both directions simultaneously
- Framed end-to-end testing
- Drop and Insert testing
- Channel Associated Signalling simulation and analysis
- Multiplexer/Demultiplexer testing
- Digital Cross Connect testing
- Automatic Protection Switch testing
- Unframed end-to-end testing

PA-41 provides all the PA-40 applications plus it has a RAM/ROM card interface which provides:

- The capability for application software, e.g. Common Channel Signalling No. 7 (CCITT Rec. Q.700 series Blue Book TUP) protocol analysis software, to be loaded into the instrument
- Additional storage for test results and instrument set-ups

CCS No. 7

Wandel & Goltermann Pty Ltd
42 Clarendon Street
South Melbourne Victoria 3205
Tel: (03) 690 6700
Fax: (03) 690 6750

Wandel & Goltermann
Electronic Measurement Technology

they recognise now that they can't ignore the rest of the world — Latin America, the Pacific Rim, Africa. We provide a lot of service in Latin America, so they've got to pay attention to that; AsiaSat pops up here in the Pacific and is tremendously successful, so they've got to pay attention to that; Astra pops up over Europe and they're very successful. What have these guys been doing? Sleeping at the switch for 25 years?

AC: *Your early opponents argued that you would skim off the cream and ignore thin-route markets. How do you respond to that?*
Landman: That was always one of the arguments. But how much thinner can you get than Latin America? By bringing the right satellite technology to that region, we have developed those thin-routes and provided real benefits including rural telephony programs and educational networks. We'll provide the same benefits in this part of the world, in Africa, the Near East, the Far East and the CIS. We don't just concentrate on the high-density North Atlantic routes where Intelsat have always taken care of their US signatory, their UK signatory and so on.

AC: *What benefits will you offer the Asia Pacific region when PAS-2 is launched next year?*
Landman: We will put high quality, high powered, focused coverage within this region. I know a lot of new domestic satellites are planned, but not every country is putting one up today, though they may in the future. We can provide coverage for countries to develop their infrastructure for telephony, business communications, trunking, thin-route, broadcasting or whatever. We've done this throughout Latin America.

AC: *What will you offer in the way of business communications?*
Landman: We can develop sophisticated corporate communications networks. Sometimes we provide the full service to the customer including satellite, the earth stations, management and maintenance of the network. At other times, we provide bulk bandwidth and power to carriers, especially emerging second, third, fourth or fifth carriers, to develop on a domestic, regional or even international basis. What I've seen happen is that countries, frustrated by their monopoly carrier, licence a specialised satellite service carrier to open things up. You're seeing this in Europe, in Latin America and in Asia. It stimulates the market, prices come down, innovative services are introduced, and the carrier becomes responsive to the market. This has a rippling effect and businesses gain better and more affordable communications.

AC: *Is it correct to say that, partly because of policy restrictions, television is your major revenue source?*
Landman: Yes, about 70%.

AC: *How will this be affected by digital compression which requires much less capacity?*
Landman: We started a digital compression system recently. We went to some analogue customers and said: 'We'll reduce your monthly bill significantly by giving you a digital channel, do you want to give back some capacity?' And they said: 'If you're going to bring the cost down, I want more than one channel. I want four channels actually, because I can reformat one, do an NTSC and PAL version and also a black-out channel version. So you can have only a little bit of that capacity back.' Digital compression will be a market stimulant rather than a depressant. It will open up opportunities for big programmers to repackage and send programs out differently and for small programmers to enter the marketplace because of the lower price threshold. We use digital compression now to bring Greek programming to North America because the price threshold came down.

"We provide a lot of service in Latin America, so they've got to pay attention to that; AsiaSat pops up here in the Pacific and is tremendously successful, so they've got to pay attention to that; Astra pops up over Europe and they're very successful. What have these guys been doing? Sleeping at the switch for 25 years?"

AC: *Is the lack of digital video standards a worry?*
Landman: We all want to see a universal standard. Anything we do in compression has always had a migration scheme to take it to that MPEG standard. My best guess is that in the first part of 1994 you'll see that.

AC: *Anselmo has said he would like to aggregate all TV programmers on one spacecraft for receipt by one dish. Is this 'hot bird' concept one of your aims?*
Landman: The approach taken on our first satellite, and we have no secrets about doing this on the others, is to create the 'hot bird,' which is an unfortunate name. But our approach to the hot bird is a little bit different from some others. In the Atlantic Region, and in the western hemisphere in particular, by adopting a policy of open access and direct access, we have programmers from virtually every country in Central, South and North America all accessing the same satellite, so you have that hot bird concept.

But it's not a matter of programs just funnelling southward, it's programs going north too. What I see here in the Pacific is that people want to communicate within the region from Australia to Asia, from Asia to Australia, from Asia to North America and back. So you could have this confluence of interests on one satellite communicating in many directions. That's what we want on the PanAmSat satellite, a real freeing up of the flow of information rather than a constriction, which is what I believe you have with our competitors.

AC: *Financing the three new satellites proved another major challenge. Is that correct?*
Landman: While our business was profitable from 1990 on, we didn't have enough money to pursue three satellites on an accelerated basis. A decision was made to look for equity investors and that took us to Japan, Europe and many other places. We spent about 12-18 months looking for equity. But it takes a very long view, a bit of a leap of faith, because the satellite business is a risky business.

AC: *And finally you turned to Televisa from Mexico, the company that had a stake in PanAmSat when it first started?*
Landman: Televisa have a very long view. They are a global media player and a huge producer of programming, which they historically have distributed out of Mexico into North America, Asia, Latin America, Europe, Asia and Russia.

AC: *What share do they have?*
Landman: All their money went towards building new assets. There was no cash-out by existing shareholders. They have a 50% interest and as part of that, they have a minority representation on the board. The day-to-day operation of the company has stayed with Anselmo and his interests, and it will continue that way.

AC: *Did you have problems securing FCC approval on the recent equity investment given previous controversies over Televisa's foreign ownership and control?*
Landman: We went to the FCC last December and they gave us an accelerated decision which was very positive. Some competitors tried a bit of a mud-slinging campaign in that regard, but the FCC in its decision made it very clear that there was no issue of foreign ownership and control on this venture or on previous ventures with Anselmo and Televisa. It was a fairly strong statement. We got our approval on December 31.

AC: *Why did PanAmSat design PAS-2 with high power beams across Australia?*
Landman: I can't say exactly what is going to happen in this region, but there is about to be an explosion in communications within the region, north-south, and across the region, east-west. We design each satellite for each ocean region, in contrast to Intelsat where every satellite has been a transplant of another one, so when we designed the

Pacific coverage, we decided to go for maximum connectivity. That means we'll have a lot of flexibility to meet the market demand and for the market to do virtually anything it wants.

AC: *Can you provide customers with connectivity between Australia and Hong Kong, for instance?*
Landman: If you want to communicate between Hong Kong and Australia, we can do that. If you want to uplink in C-Band or Ku-Band or come down in either band, there are 16 possibilities. If you want to drop down in the US at the same time, we can do that too. And if you want to go up in C-Band and come down in Ku-Band in China, we can do that too.

AC: *What is the size of uplink antenna in Australia?*
Landman: In Ku-Band, it would probably be 1.2-1.8 metres, depending on the type of service, and at C-Band probably 2-2.4 metres, again depending on the type of service. You will receive on antennas that are never more than 2 metres. And those antennas are for your roof, not for some distant gateway where you have to pay for the terrestrial infrastructure to bring the information to your office, which introduces added cost, makes it less dynamic and, of course, you do suffer some unreliability.

AC: *If I understand Australia's regulatory situation correctly, international customers with rooftop antennas can lease capacity directly from PanAmSat, provided they are interconnected to the public switched network at one end only.*
Landman: I'm glad you understand it!

AC: *I'm not that certain! But domestically, it appears that customers, including television, can only lease PanAmSat capacity through one of the carriers to protect the duopoly. Is that your understanding?*
Landman: We've hit regulatory situations as good, better and a lot worse than Australia. Any country has its own unique set of rules that are generally in transition. I firmly believe that monopolies aren't in anyone's interest, whether it's the country's interest or business interests. They're not even in the monopoly's own interest, if we really had a little foresight and wisdom.

AC: *What about a duopoly?*
Landman: The same thing. Duopoly is two monopolies working in partnership. I used to love the duopoly in the UK with Mercury and BT. All they had to do was watch the other guy and keep their prices at the same level or slightly lower. We saw no innovation and very little market stimulation.

AC: *In Australia, have potential customers complained about going through the carriers who presumably will mark up the price of PanAmSat capacity?*
Landman: You can ask that question about any country. I think it sticks in most people's throats.

AC: *Have potential Australian customers complained?*
Landman: We haven't addressed that issue, but it's a concern everywhere. We've seen mark-ups of seven per cent and seven hundred per cent. I don't like mark-ups.

AC: *Isn't direct customer access one of PanAmSat's main selling points in relation to Intelsat?*
Landman: There are a couple of issues here. One is when we have to use a carrier's ground facilities, which is not the situation in Australia. Going through a carrier for access to PanAmSat is another issue. If the carrier allows for a modest administrative mark-up reflected in the amount of effort, perhaps licking a stamp, that's one thing. But a gouging mark-up is something we have fought in some parts of the world and if that's the situation in Australia, we'd fight it there. I think it's hard to justify exorbitant mark-ups when there is absolutely no value added.

AC: *In the domestic market, will PanAmSat be competitive with Optus satellites?*
Landman: Our coverage of Australia will be comparable to Optus.

AC: *Are you promising lower prices?*
Landman: Our overall offering is better, and in a competitive situation I think we've been able to come in at a better price than anyone else.

AC: *Have you received strong interest from Australian customers and if so, from whom?*
Landman: I can answer the first part of the question, which is 'Yes.' I can't answer the second part.

AC: *The Australian media has published several items about both PanAmSat and Intelsat delivering Pay TV direct-to-homes from the US. Are you planning that?*
Landman: We certainly have the technical capability to do that, but as I understand the law right now, the person doing that would be subject to a healthy fine, which is something like one or two million dollars.

AC: *Even if I subscribed from the US using a credit card?*
Landman: I've read the regulations, and it's a bit unclear.

AC: *You mentioned to me earlier that the media seem to view PanAmSat as orchestrating a bypass of the current broadcasting structure.*
Landman: We wouldn't orchestrate a bypass of regulations. We are relatively passive

People Like Talking To Hi-Call

Hi-Call is the premier voice services platform for value-added network applications in more than 20 countries worldwide.

And no wonder, because the powerful new **Hi-Call** range provides friendly voice technology for every kind of information, entertainment, telemarketing or enhanced network service. PSTN, ISDN, Mobile and Paging networks can all benefit from the application of **Hi-Call** technology.

Advanced interactive options on all lines. Many thousands of lines in a single installation. Rapid access to services via DDI and ISDN signalling. Multiple high-speed host interfaces for database applications. All integrated on the **Hi-Call** platform by PDL - the world's leading applications language for interactive voice services.

Hi-Call can deliver the promises of tomorrow's Intelligent Network to today's telephone users.

Call Telsis for the full story.

Telsis

Bringing technology to life.

TELSIS PTY LIMITED
119 Willoughby Road
Crows Nest NSW 2065
Australia
Tel: + 61 2 9563803
Fax: + 61 2 4392143

TELSIS PTE LIMITED
10 Hoe Chiang Road
#14-05 Keppel Towers
Singapore 0208
Tel: +65 2245585
Fax: +65 2247356

in that role. If a customer wanted to try and do that, then we would work with them, and with the regulations, to see if it could be done. But it's not as if we're out there saying: 'Here's a way to break these regulations and do something illegal.'

AC: *Australia is really a tiny market when you look at the coverage of your new Pacific and Indian Ocean spacecraft. Have you, for instance, received strong interest from the Japanese market?*

Landman: And your next question will be who have we been talking to! What I can say, whether we're talking about Australia, Japan, Hong Kong, Taiwan, New Zealand, or the US Trust Territories, is that the market is not adequately served. There is a pent-up demand for something that will allow people to communicate in new and different ways.

AC: *In the Pacific, PanAmSat is planning to park PAS-2 very close to an orbital slot 'reserved' for Papua New Guinea's Pacstar, which has a special 'grandfathered' status under ITU Radio Regulations. Why did you go for that slot?*

Landman: We have two slots, one very close to Papua New Guinea's and one that has some distance. Whenever Papua New Guinea decides to launch their own dedicated satellite, I think there is area in that orbital position that will allow them to do what they want, and we'll be happy to work with them at that point. In the interim, they may want to use our satellites.

AC: *So you intend to use the slot near PNG?*

Landman: Sure.

AC: *I know there is competition for scarce orbital slots in this region and Pacstar has been a paper proposal since about 1984, but does this mean the first-up can just occupy any slot?*

Landman: People are going to have to look into this sort of warehousing of orbital slots. The US will not grant you slots and let them lay fallow. They review each year, you can never have more than two slots empty at any given time, and if they don't see you doing something, they'll take them back. But there are some countries that have been renewing their orbital filings for years. They authorise three or four slots to an operator who does nothing for years on a diligent basis to fill up the third or fourth.

There is going to have to be an overhaul of the whole process, because there are people willing to put up real satellites to provide real services to real customers and satisfy a whole spectrum of needs, and there are others just hoarding the slots like pirates of outer space.

AC: *Are you pointing to Tonga there?*

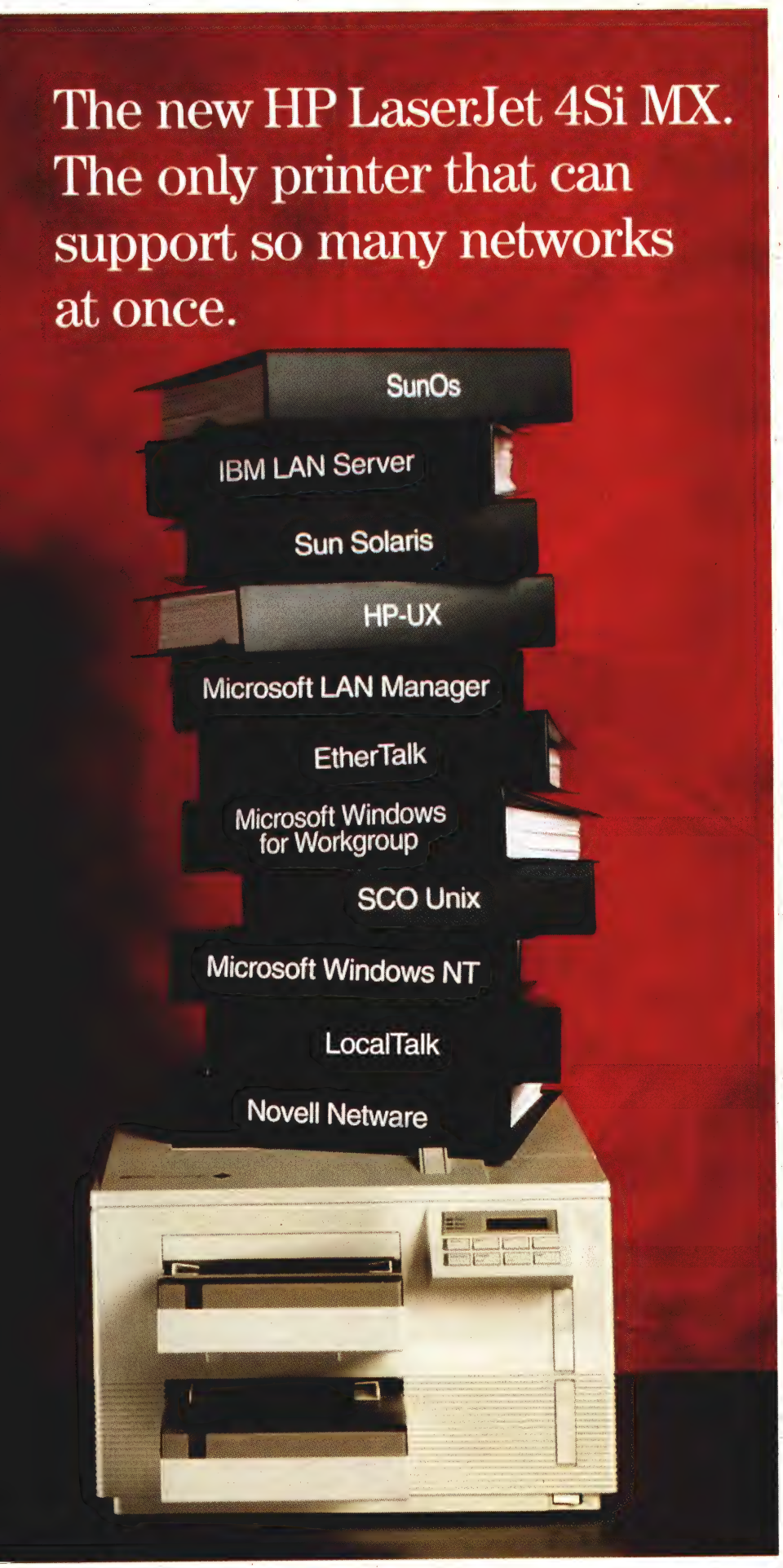
Landman: Among others. You have Intelsat just parking nearly-dead or last-breath satellites in slots and saying: 'Look, we're really using this.' In October 1991 we were Advance Published with the IFRB [International Frequency Registration Board] for slots at 68 and 72 degrees East Longitude in the Indian Ocean region. Then a few weeks ago, Intelsat filed with the IFRB for 69 degrees East. How the hell do they think they're going to operate one degree away from us?

AC: *There are an increasing number of disputes over the key Fixed Satellite Service slots. Is it a matter of getting there first?*

Landman: I'm the last one to try to deny access to space. We are pro-competition. Intelsat has kept us sharp, and others will keep us sharper. But it is a big mistake to sit on and hoard a scarce resource. In the case of PNG, I think they're approaching their 8th anniversary. There will be a way to accommodate Pacstar somewhere nearby when and if they want to operate a satellite system.

Liz Fell is a freelance journalist and a Senior Research Fellow at CIRCIT.

The new HP LaserJet 4Si MX. The only printer that can support so many networks at once.



600

600 dpi, resolution enhancement technology, microfine toner.

PCL5

Enhanced PCL5.

Adobe® Postscript® Level 2 – standard.

Up to 34 MB of memory.

Up to 2000 sheets & 100 envelopes. Plus optional duplex printing.

AAA

80 scalable typefaces.

Introducing the HP LaserJet 4Si MX. The only network printer your office will ever need. Supporting up to ten different network operating systems simultaneously, it incorporates no less than four network protocols. It can seamlessly switch protocols and languages at full engine speed for most documents.

What's more, the Auto Driver update makes installation across the LAN a breeze. (eg: Two minutes and one screen for most Novell networks.) Plus, the SNMP compliant support allows administrators to remotely monitor, isolate and troubleshoot printer problems. The bi-directional interface will even let you know when paper and toner are required. It also prints 17 pages per minute and has a 75,000 page per month duty cycle.

As you'd expect, the HP LaserJet family has superior print quality, connectivity, software compatability and reliability. For more information, call 13 1347, 0800 441 053 (N.Z.) or see your nearest authorised HP dealer.

HEWLETT PACKARD

A Better Way.

JWT HPC 297

Tom Amos

The Pre Fix

Have you ever tried to dial a prefix like the nominal 1 when using a mobile telephone? You continually get the strangest message that the 'number is no longer connected' even if it's your own number and you know it could not be true. The era of competitive choice and dirty tricks is already upon us, even before the 'chance of a lifetime' pre-selection ballot later this year, which will determine the future market shares of both AOTC and Optus.

But back to the prefix problem for just a moment. I was fascinated as to why the prefix did not work, when it was supposed to apply to all basic services. Ominous undertones of secret deals? No. Just a marketing dead-end and the suggestion that I had a problem. I came no closer to finding out why it did not work even after some serious investigations . . . all I know is it still does not work!

The lines are being drawn for what will be the ballot of the century. Forget political elections from June onwards — if the prefix play is any indication of what is to unfold, we can expect a no holds barred (no pun intended) advertising and deal junket that will be truly mind numbing. If you consider the current level of advertising that AOTC and company place in both the electronic and print media, then scale it up from Chuckie to the whole business, you will quickly realise that you'll be unable to avoid the coverage and will have to make a decision. Who do you want to be the carrier of your choice?

A few years back, about half the population had a horror story to tell about either billing or service, and the other half didn't care. It's really tough being a monopoly. Times have changed, and service has improved. We now even get 'Hitchhiker's Guide' messages like 'thanks for choosing Telecom' when calling overseas, after Optus introduced them on their services. That does not apply, of course, if you ring from a mobile and dial 1 first.

Faced with this type of market perception and enormous potential leakage, Telecom is changing its image, distancing itself from the past and moving into the discount services business quicker than you can blink. The aim is to keep the customer base at almost all costs, and then re-adjust to the new world after the ballot is over.

There will only ever be one ballot and this is it. The two campaigns have the potential to be more internally focused on the two carriers, rather than the benefits to the user community of choosing either one of the providers. Telecommunications is still transparent from the users' perspective, regardless of the marketing hype, so our aim should be to extract the best deal and value from that angle. There is going to so much flim-flam flowing that the average user will be bewildered and could easily choose on the basis of the jingle, but for the serious user the first confusion will arise when trying to correlate the records and the bills of the past with the number of lines that the carriers claim you have.

History tells us that the error in most unstructured organisations exceeds 5%, and this alone will cloud the issue for many when it is combined with a discount. Decisions, decisions. It takes me back to the old MCI/AT&T/RBOC days of the 1980's. The games are already looking remarkably the same — all that has changed is the date, the rules and the umpire. What was learnt then was that billing and the method of billing were the keys to user happiness. A good billing arrangement went a long way to removing most gripes, and an on-the-ball customer relations department helped immensely.

Discounts, service levels and bills should be the topics of the debate from the users' point of view this time, with a clear understanding that there should be no loss in any current conditions.

For example, consider the billing arrangements. Telecom currently owns most of the customer access network (wire lines), and if you choose to go with them then you would get just one bill for all the calls on the service. Likewise, if you choose Optus then you again should only get one bill, as you now are Optus' client and it is up to them to come to an arrangement with Telecom for provision of your service. That is a no-roll-back position, but the secret deal department (read marketing department) on both sides would already have us believe that two bills are much better than one — transferring the management cost of the choice to the user with a slight of hand and doubling the paper work to boot! No deal.

The carriers seem more concerned with centralised versus decentralised voting, whether the communications manager can vote for the whole organisation or not, how the votes are to be counted, and who checks the counter.

Forget the lunches — this is a golden time to extract that special long term deal, maybe a concession or two on indial, or just a deal that has some movement in terms of cost related services and prices. Telecom is limited by the dominance provision of the Act, whilst Optus does not have too many services. There'll be no better time than this, as one carrier is vitally concerned about leakage and the other about gaining as much market share as possible.

Whilst all of this is going on, a new number plan will be commencing — the plan Telecom is now telling anyone who will listen is going to cost Telecom and users a lot of unnecessary time, effort and money, and is the work of a heartless Austel.

What Telecom forgets to say is that it was their idea and plan that was adopted without question by Austel. More confusion . . . less leakage! Rewriting history is part of the marketing plan in the battle for the more than 7 million telephone accounts throughout Australia. Phantom voting and the unconsidered consequences of the votes of the lines that are not supposed to be there will also be side issues in the redistribution.

One thing is sure — Telecom is going to have less market share after the ballot than today. Maybe this is the time to get that special number, and, if I asked nicely, I could probably be allowed to dial 1 from the batphone. The stakes are high, and the opportunities are great, and, for the ballot of the century, it will be a buyers' market. Buy well.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

Richard Butler

The Regional Development Challenge

A little over a decade ago, in 1983, the world community heralded in World Communications Year (WCY) which had 'Developments of Communications Infrastructure' as its theme. The programme stimulated an in-depth examination of communication infrastructure policies, technology choices, investment priorities, human resource development and their key relationships in telecommunication for development. Later, with close cooperation by all sectors of our industry, the Singapore Authorities and the ITU, first hand views of the great progress made were available at Asia Telecom 85 and Asia Telecom 89.

The international and individual national action programmes of WCY were followed by various initiatives, including those of the Independent Commission for Worldwide Telecommunication Development, the banking institutions, and the promotional work of the ITU, UNDP and regional organisations. These activities have led to informed appreciation of the important relationship of telecommunications to the development process. Indeed, telecommunications has become recognised as an important lifeline in the economic health, national competitiveness, prosperity, social well being, trading, security and even sovereignty of any nation. So the lack of adequate development cannot be attributed to insufficient knowledge of the importance of the sector.

The displays of products, services, systems and network applications at Asia Telecom 93 will again present the marvels of the electronic revolution. These products will confirm our entry into the era in which electronics applications permeate all fields of communication. None of these applications could have arrived without many cooperative steps, from concept to design, manufacture and production, along with the other prerequisites of connectivity standards, investment, finance, trade, transport and the like, with growing partnerships and alliances. Yet these are just the tip of the iceberg of potential cooperative actions in the search for growth and balanced development in this, the fastest growing economic region. Telecommunication is a major driver in this growth.

Many countries have followed the trend towards greater diversity, liberalisation, corporatisation, and where appropriate, even privatisation of their telecommunications sector, with costs, efficiency, accountability and recapitalisation in view. Such structural adjustments must remain country-specific. Each country is different.

Nevertheless, even with all of this progress, telephone penetration in half of the countries in the Asia-Pacific region is less than one telephone per 100 inhabitants — completely inadequate in a world of growing interdependence. It is a matter for consideration at the highest policy and political levels because of the wide implications for economic progress, peace and social well-being. How to remove or unblock impediments to more balanced developments is a serious policy issue. This is a major challenge — and more so now than ever, as recent improvements in technology can assure opportunities for even low cost multipoint-to-multipoint basic services from anywhere-to-anywhere.

Indeed, the challenge is to unlock the political will to cooperate more fully in this development process to the mutual advantage of members of the region. Actions must be consistent with the national aspirations of each country and its priorities. The matters are complex, and the study paths are well worn. But just as the changing environment has put in place considerations towards universal service objectives within nations, some mechanisms may well be found to extend those concepts regionally in the mutual interests of balanced development. The recognition of growing interdependence brings responsibility for more harmonious development actions. This is particularly so for satellite and other wireless applications to which the nature and geography of the region lends itself.

There are important considerations in the planning and use of the radio spectrum and outer space. Uses focused on the geostationary orbit for 30 years, but since WARC '92 prospects are evolving for the advent of a whole range of new potential uses for low earth orbit satellite applications. To those we should add the continued progress and expansion of mobile services, digital audio satellite broadcasting, high quality TV services and diverse space applications.

Like outer space, for which special treaty provisions have been agreed between governments, the spectrum is recognised as a limited natural resource. In addition to the established international and national systems there are new national and regional satellite system ventures in differing planning phases, bringing diversity, choice and competition. For some parts of the geostationary orbit there are potential conflicts in the identification of nominal orbit positions from which particular satellites would operate. More systems are intended than can be accommodated at some orbital locations, taking account of existing and previously agreed planned use.

Parties are obliged to reach agreement during the coordination and pre-satellite hardware commitments phase. Priority protection against interference does not arise until the coordination process has been achieved, notified to the Radiocommunications Bureau (previously the IFRB) of the ITU, and registered in the Master International Frequency Register.

Previously, technology advances eased the way for improved and increased use of the orbit. In the absence of agreement or the absence of other solutions, such as greater common use sharing or new concepts of space platforms, the risks in establishing any systems would be high. The continued absence of agreements at the coordination stage may need some bi-multilateral mediation arrangements between the parties; if not, the matters could lead to consideration again for improved planning and coordination provisions and obligations in a future World Administrative Radio Conference. But with only few parties concerned this could be an expensive solution, which may not produce the right answers for more efficient use of the spectrum.

Richard Butler, AM was Secretary General of the International Telecommunication Union, 1983-1989.

Some of the world's finest are home grown.

Like Australia's world renowned wines our LAN hardware is second to none!

With a range of world class connectivity products from Australia's only LAN manufacturing company, INC Manufacturing.

All with a 2 year warranty and delivery from stock, INC products are available nationally through selected dealers and integrators.

INC offer a unique range of solutions for

Token Ring

Passive and Active MAU's
Copper Repeaters
Fibre Optic Repeaters

AS400

Passive LWC's
Active Wiring Concentrators
Active Stars
5250 Emulation Boards
5250 Multiplexers

Ethernet

10 Base/T Transceivers
8/16 Mbps Cards
6 and 12 Port Hubs

Call us on 008 807 982.

INC
MANUFACTURING

INC Manufacturing Pty Limited A.C.N. 051 977 701
29 Attunga Road, Blaxland NSW Australia
PO Box 182 Glenbrook NSW 2773 Australia
Phone 047 39 6111 Fax 047 39 4247

INC1012

Where are Metropolitan Area Networks Going?

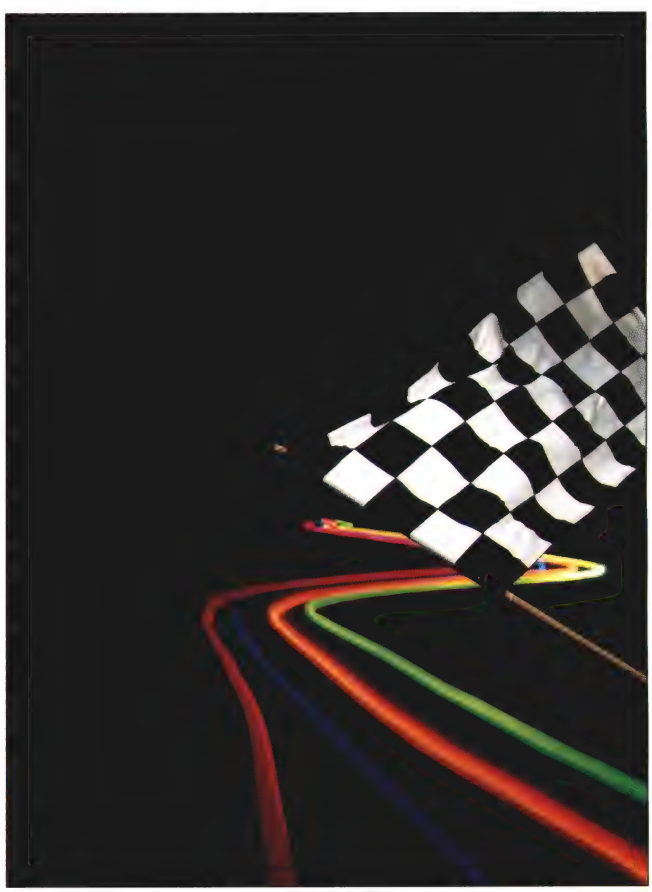
Telecommunications companies around the world are trialling and installing high speed metropolitan area networks. But as Stewart Fist explains, there are great differences in the approaches being taken.

Among the alphabet-soup of service definitions surrounding Distributed Queue Dual Bus (DQDB), Fastpac and Metropolitan Area Networks (MANs), there's one that stands out in the US literature — SMDS (Switched Multimegabit Data Service). We've all read about SMDS, but there seems to be some confusion about what it really is.

Our natural jingoistic bent has probably impressed on all by now that SMDS is based on the Australian-invented DQDB IEEE 802.6 technology — a fast-packet switching system developed by QPSX Communications in Perth. So this country has a proprietary stake in the development of MANs around the world. But if this is so, why are we being told that SMDS is 'technology independent'? There also seems to be important difference in the way we are implementing 802.6 MANs in Australia, and how they are doing it in the rest of the world. Even the term 'MAN' is ambiguous.

In Australia, Fastpac is postulated as a 100km wide ring of dual-fibres through the city and suburbs, with the primary access points in local exchanges for the Fastpac 2 (Mbps) services, and with nodes actually within the boundaries of large factories and office complexes for Fastpac 10, directly linked to company LANs. But in the United States, DQDB is seen as an access system to a high speed digital data 'SMDS cloud.' In the local area, the network is a star-bus with single Customer Access Network (CAN) connections (using DQDB protocols) radiating out from the central exchange. This doesn't appear, at first glance, to be a MAN within the Australian meaning of the term — it's more like a conventional telephone network, but they call it a MAN.

It all seems a bit difficult to understand what part the Australian invention has in all this. QPSX holds the key patents to DQDB (mainly the technique of queued access), and it has licensed only Siemens and Alcatel to make DQDB equipment. The IEEE has been quite unambiguous about DQDB as *the* 802.6 specification, so why such variations in the implementation?



Why the Difference?

To understand the way DQDB is being used around the world, you've got to delve a little into the history. The idea of the MAN as a shared 'large-loop' network covering large metropolitan areas, actually originated with those arch-enemies of US telcos, the cable TV organisations, which had stretched their CATV coaxial cables though the wilds of the American urban jungles for TV feeds.

A decade back, the introduction of optical fibre and the threat of ATM-based broadband services by the telcos began to loom as a potential threat to the cable monopoly as the RBOCs spent a fortune lobbying Congress to be allowed to handle television distribution in competition with the cable companies. So the cable companies returned the threat by lobbying the FCC to be allowed to provide voice and data services, and they constantly raised constitutional questions with the Supreme Court on the vertical integration of the telcos. The cable companies also took practical steps by funding research into the use of shared coaxial as a common carrier for

Latency and Delays

Unlike local area networks, DQDB's dual-fibre approach means that the network will work efficiently right up to its maximum design limit (usually 34 or 140Mbps). Each fibre carries a continuous chain of 'frames,' and these are subdivided into 'slots' of 125 microseconds. This constant flow of slots allows cells from many different users to be carried simultaneously on the network, no matter how far it extends.

However, since the incoming datastreams are packetised and stored in queues until sent out as 53-byte cells over the bus or loop in the first available 'slot,' DQDB techniques do introduce indeterminate delays into the network traffic. This is supposedly why the current emphasis is on data in all forms of SMDS — but it is more likely that the telephone companies simply don't want self-competition with existing voice and videoconferencing services.

DQDB is designed to support isochronous (real-time) services through a special form of slot-partitioning. The network management system can designate certain regularly-spaced slots in every frame as being for isochronous use, and the payload of these slots can be shared between a small number of users. This shared-cell technique results in fewer bytes being delivered on a voice/video channel in each slot, but there's a higher delivery cycle which is deterministic in nature — which is what real-time interactive services need.

Stewart Fist

Fastpac vs SMDS

In Australia, mention of the term 'metropolitan area network' conjures up a vision of a large looped LAN buried in the ground in a 50km wide loop around a city. But in the United States the term is wide enough to encompass any type of switched data service — even one that is not remotely LAN-like. A Telecom exchange with a 2Mbps switch attached to radiating Megalinks would be a MAN in US terms, and that is how it is being used with SMDS.

SMDS and Fastpac are 'telecommunications services' of which only Fastpac is clearly tied to the DQDB technology. A number of the RBOCs in the States operate MANs which use FDDI — and these are much closer to the MAN as we know it in Australia than they are to SMDS — but FDDI doesn't fit the IEEE's 802.6 MAN specification.

DQDB is short for Distributed Queue Dual Bus — a term which incorporates the two fundamental elements of this 'ATM cell-switched' (small-packet) technology.

The 'Distributed Queue' is a way of allocating fair access. With MAN operations, many companies in a geographical region will use a single 'shared medium' (usually dual optical fibres) stretching perhaps for a hundred kilometres in a large loop. DQDB is the way of controlling access to a conventional MAN, but it is not needed for point-to-point operations.

The 'Dual Bus' part of the name refers to two strands of contra-directional optical fibre media — one for 'upstream traffic' and the other for 'downstream traffic' (although microwave links have been used).

By having the nodes ('clusters' — entry and exit points) positioned between the fibres in a ladder-like topology, the distributed access controllers have contact with each data-stream and can implement the counters which are necessary to clock reservations being made down-stream, and the number of empty slots allowed past to satisfy these reservations. It is these counters, acting independently at each node, which control access to the network in a distributed way.

There are three different types of connection topologies which are able to use the DQDB protocols:

- The Open Bus point-to-point connection with access only at the ends of the fibres (which also generate the frames);
- The Closed Loop, which allows multiple connections at a number of nodes along its length. The frames for each of the counter-directional fibres are being generated in the same device; and
- The Open Loop, which is essentially a broken Closed Loop, where the nodes on each side of the break act as frame generators. The existence of this topology makes the Closed Loop particularly robust.

Within public data networks, these different architectures can be applied in three different areas of the internet:

- For the main MAN loop. This is always a closed loop in Australia. In the technical parlance of SMDS, this section of the network is called the MSS or MAN Switching System.
- For the CAN (Customer Access Network). This will be an Open Bus extending from the customer's premises to the nearest node on the MSS. In Australia, we don't use DQDB for this because the main loop of the MAN/MSS passes through the customer's premises for Fastpac 10. For Fastpac 2, the customer is linked to the MSS at a cluster (essentially a DSU) in a local exchange, using a 2Mbps copper cable and a special pseudo-DQDB protocol which handles the data in intermediate packets, rather than the ATM-cells.
- For bearer services between MANs or SMDS exchanges. SONET/SDH may be used to carry the ATM cells to provide these bearer connections wherever adjacent MAN/MSSs don't touch.

two-way voice and data. These were the first real MANs.

Eventually the suits and counter-suits ground to stalemate — and at that stage the RBOCs became interested in taking over the cable-developed MANs as a staging-post along the way to local ATM-switching and Broadband ISDN. But they certainly weren't interested in any form of shared-media system that the cable companies could use — which is the type of MAN that we will use in Australia. That would be playing right into the hands of the cable companies.

So the Americans rejected the looped topology and opted to use DQDB's switching and access protocols within a much more conventional network architecture. This also provided them with an ideal way to move quickly into ATM-switching and elementary B-ISDN services when these systems begin to emerge from the labs.

The ATM Challenge

We've all heard that DQDB is an ATM-based network technology, and it's now pretty clear that the ATM-type fast packet-switching networks are the way of the future. ATM at the LAN level is setting a cracking pace at present, and ATM-based SMDS is already threatening to push frame relay off its Warholian ('15 minutes of fame') perch for LAN interconnect.

There are two types of ATM switch: The shared-backplane variety is used in most (but not all) LAN-type situations (and in the DQDB system), and the 'delta' types (Banyan or Omega) which are the 'non-contention' switches needed by the telcos for high speed public systems. Backplane switches are already around, and delta switches seem to be less than a year away.

So the question becomes: Is there a window of opportunity for DQDB systems before ATM and B-ISDN begin to move in?

Apparently the telcos around the world think so, and QPSX takes the position that you soon won't be able to distinguish one from the other. QPSX's Tom Templeman insists that his company is building and migrating the technology in a way that will make it the B-ISDN of tomorrow. "B-ISDN isn't the mysterious Holy Grail any more," says Templeman, "We are [now] talking about current broadband services replacing the old leased line and point-to-point services. SMDS is just one variant of broadband and Fastpac is another."

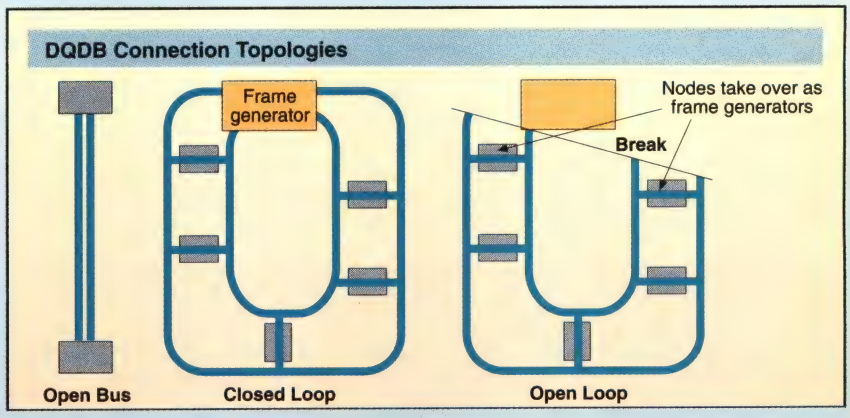
In Australia, we are building large-loop MANs, which I'm going to call 'macro-MSSs.' In these city-wide loops of dual fibre, the switching function is physically distributed as it is in a normal LAN — each node does its own. And since these loops pass through the premises of Fastpac 10 customers and close by the Fastpac 2 premises, we don't use DQDB in any access systems. Ethernet, Token Ring, etc. can make direct entry into the cluster-controller on the main macro-MSS (or via the 2Mbps packet protocol for Fastpac 2).

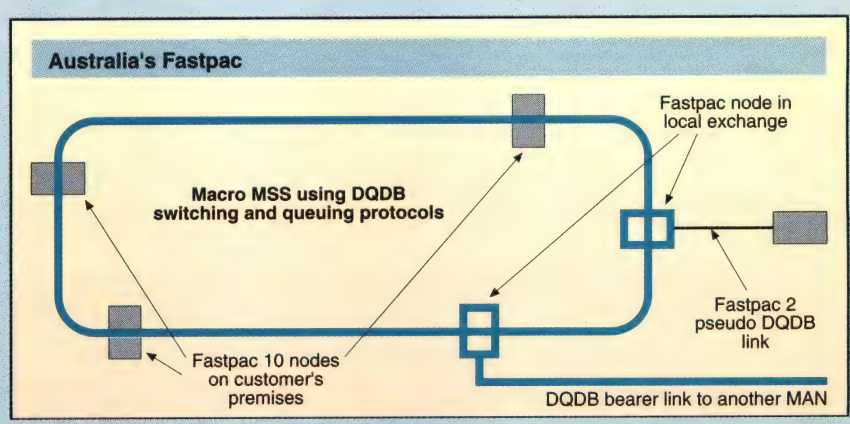
But imagine this MSS shrunk down until it was just a few feet across (a 'micro-MSS') and housed in a single exchange building — this is the American approach. Now the CAN network becomes the major component of the network, and here the Americans are using Open Bus point-to-point DQDB links — where they don't really need the queuing protocols.

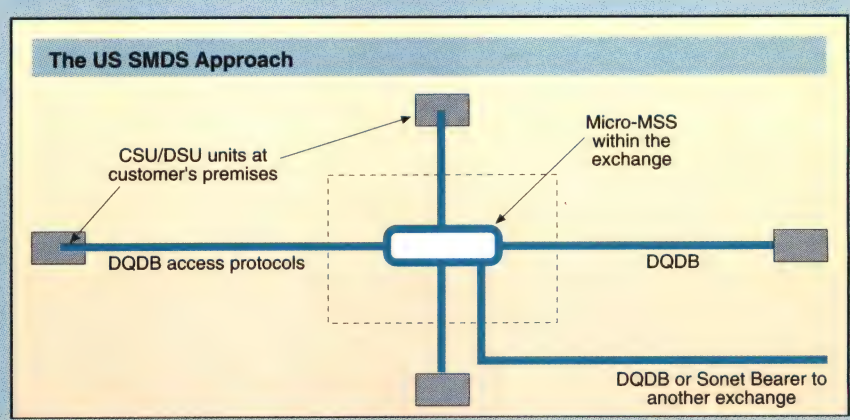
An American company's LAN traffic will be concentrated into a router which packetises it and then passes it to a CSU/DSU unit on the customer premises. This creates the DQDB ATM-cells and places them on the CAN fibre link to the exchange (usually a DS-3 45Mbps fibre). There they will make contact with the micro-MSS through edge gateways, and the DQDB/MSS is now simply being used as a centralised switch — not a distributed switch and transport mechanism as in Australia.

Currently, in American SMDS services, this micro-MSS is using DQDB protocols for switching, but by taking this 'radiating architecture' approach, the Americans are positioning themselves to move quickly over to connection-oriented ATM-switching, and later to fully-blown B-ISDN switches and networks. And since the switching is now centralised in the exchange building, it makes sense to carry the information between telco exchanges over a SONET/SDH network.

Stewart Fist







When you look at the implementations of SMDS and Fastpac, one glaring difference in their use of the DQDB protocols is very obvious. In the US, the protocols are primarily providing access control for the CAN. In Australia, they are being used totally for the MAN Switching System (MSS) itself.

It is hard at first glance to see why any SMDS user would want queuing protocols to police access on a point-to-point link owned by the one company and controlled by its own router. But, in the future, the telephone companies expect to have a number of access points on each CAN connection (within a factory or office complex) and that's where the queuing protocols will be needed. So currently DQDB is seen as good to have, but not essential.

Another possible answer to the puzzle lies within the SMDS exchange itself. The Americans are using within the exchange building a 'micro-MSS' — a DQDB-based MAN-loop which may only be a few metres of cable joining Edge Gateways (EGWs). On a much larger scale, this is the looped MSS network structure Australia will use across a city (the 'macro-MSS') — taking the loop to the customers, rather than bringing the customers to the loop.

The point is that in SMDS, the DQDB protocols on the closed loop MSS are being used just as an exchange switch. This MSS switch will later be replaced by full ATM connection-oriented switches, so DQDB is definitely a transitory technology here, but it will probably remain in the CAN. These local SMDS exchanges are linked together by point-to-point DQDB bearer systems initially, but later ATM over SONET/SDH (Synchronous Optical Network/Synchronous Digital Hierarchy) will carry the inter-exchange traffic. There's already a St Louis trial underway using SONET for linking SMDS networks.

The Americans have taken this approach because it gives them a way of stepping directly into a B-ISDN-like network, while

Glossary

ATM Asynchronous Transfer Mode. This has now become both a specific term for a cell/fast-packet switching technology, and a more generic term for any system using the standard 53-byte (5 + 48-byte) cell structure. ATM combines allocated and dynamic bandwidth to offer the advantages of conventional packet switching but with the high speeds of circuit switching.

CBDS Connectionless Broadband Data Service. The European term for an SMDS-like standard which uses European access rates/standards. It is now being aligned with SMDS.

Connectionless Networks in which no logical or physical connection is required between sender and receiver at the time of transmission. The data units (called datagrams) are sent and addressed individually. The term implies that each data segment (packet) will carry a complete address and be self-contained.

Datagrams Any short message unit (packet or cell) sent over a connectionless network. It must contain a source and destination address, and be 'self-contained.'

DQDB Distributed Queue Dual Bus. The IEEE 802.6 metropolitan area network technology originally invented by QPSX. It consists of the core queuing protocols plus a number of other protocols essential for the management of contra-directional dual-buses.

DSU/CSU Data Service Unit/Channel Service Unit. A device that uses the two lowest layers of the SMDS Internet Protocol (SIP) to segment and reassemble packets. This cell-creating unit is generally in the customer's premises and provides the interface to the SMDS transmission facilities.

EGW Edge GateWays. These are the points of attachment (nodes) of the customer access network (CAN) to the MSS when both are using DQDB protocols. They control the flow of traffic to the CAN in SMDS. Their job is replaced by clusters in the Australian Fastpac system.

Frame The major electronic 'structural feature' of DQDB transmission. Frames are generated at each fibre's head-end, and these frames are subdivided into slots of 125 microseconds each, which can then accommodate a standard ATM cell. The relationship between slot-numbers and frames depends on the primary transmission rate of the core network.

ICI Interexchange Carrier Interface. The interface between different SMDS networks. It involves much more billing and management information than is necessary in Australia.

ISSI Inter-Switching System Interface. This interface, when it is defined, will allow the SMDS switches of one vendor to talk to those of another within a LATA. Remember that eventually SMDS switches will progressively migrate to ATM-switching and B-ISDN, so this will become increasingly important.

IXC Inter-eXchange Carrier. MCI, AT&T, Sprint and about 300 other small companies which are permitted to carry traffic from one LATA area to another across the United States.

LATA Local Access Transport Area. The geographical territory in which American local telephone carriers have a monopoly. San Francisco, for instance is in one LATA, while across the bay, Oakland is in another. These two LATAs are not permitted to directly exchange traffic; it must always pass through the hands of an Inter-eXchange Carrier like MCI or AT&T.

MAN Metropolitan Area Network. In common Australian usage the defining features of a MAN seem to be: *a)* city-wide coverage, *b)* high speed shared medium able to carry many hundreds of users, *c)* switched access to all users if required, and *d)* a connectionless system. The term is used more generically in the US.

MSS MAN Switching System. The main closed loop along which the switching of cells takes place in a DQDB system. Can be a macro-MSS which is equivalent to the Australian MAN, or a micro-MSS (basically an exchange switch).

PDU Protocol Data Units. The 'packets' of information in any packet-handling system. In SMDS, Layer 2 PDUs are the standard ATM-based cells of 53 bytes while Layer 3 PDUs are the intermediate packets which are variable in length up to 9,920 bytes (before subdivision into ATM-cells).

QPSX Queued Packet and Synchronous eXchange. The name originally applied to IEEE 802.6 DQDB technology. It is now only the name of the patent-holding company.

RBOC Regional Bell Operating Company. The second level hierarchy in the American telecommunications structure. An RBOC will be a parent company to a number of local telephone companies, each dealing in their local area (LATA). There are 7 RBOCs covering the US.

SHDS Switched High-speed Data Service. The United Kingdom term for a MAN similar to Fastpac, but possibly moving more into line with Bellcore's SMDS specifications.

SIP SMDS Interface Protocol. The interface definition between the network and the end-user.

SLOT The 125 microsecond subdivision of a standard DQDB transmission frame into which an ATM cell can be fitted.

SMDS Switched Multi-megabit Data Service. A service definition which currently is based on DQDB 802.6, but which will eventually migrate to use ATM-switching and B-ISDN in the future.

Australia sees the immediate future in providing MANs; we can worry about the B-ISDN migration issue later. Either approach could be right.

Regulatory Restraints

We must also remember that America has substantial constraints on the topology of its technologies because under anti-trust legislation, US carriers are divided into local, regional and long-haul operators, with strict controls over who can provide what service, where. Europe, with its jingoistic telecommunications companies now forced to co-operate under the EC umbrella, faces many of the same territorial problems.

In Europe, ETSI has defined its version of an SMDS called CBDS (Connectionless Broadband Data Service) to allow the carriage of voice, video and data, while a rival SMDS Interest Forum has specified a data-only SMDS-clone using the European E-type access rates.

ETSI has now pulled out of the process, and CBDS and SMDS are being aligned. The main differences between the American and the European standards now appear to be in the use of European access rates with CBDS, and also the inclusion of isochronous (real-time voice and video) services — in the definition, if not in practice.

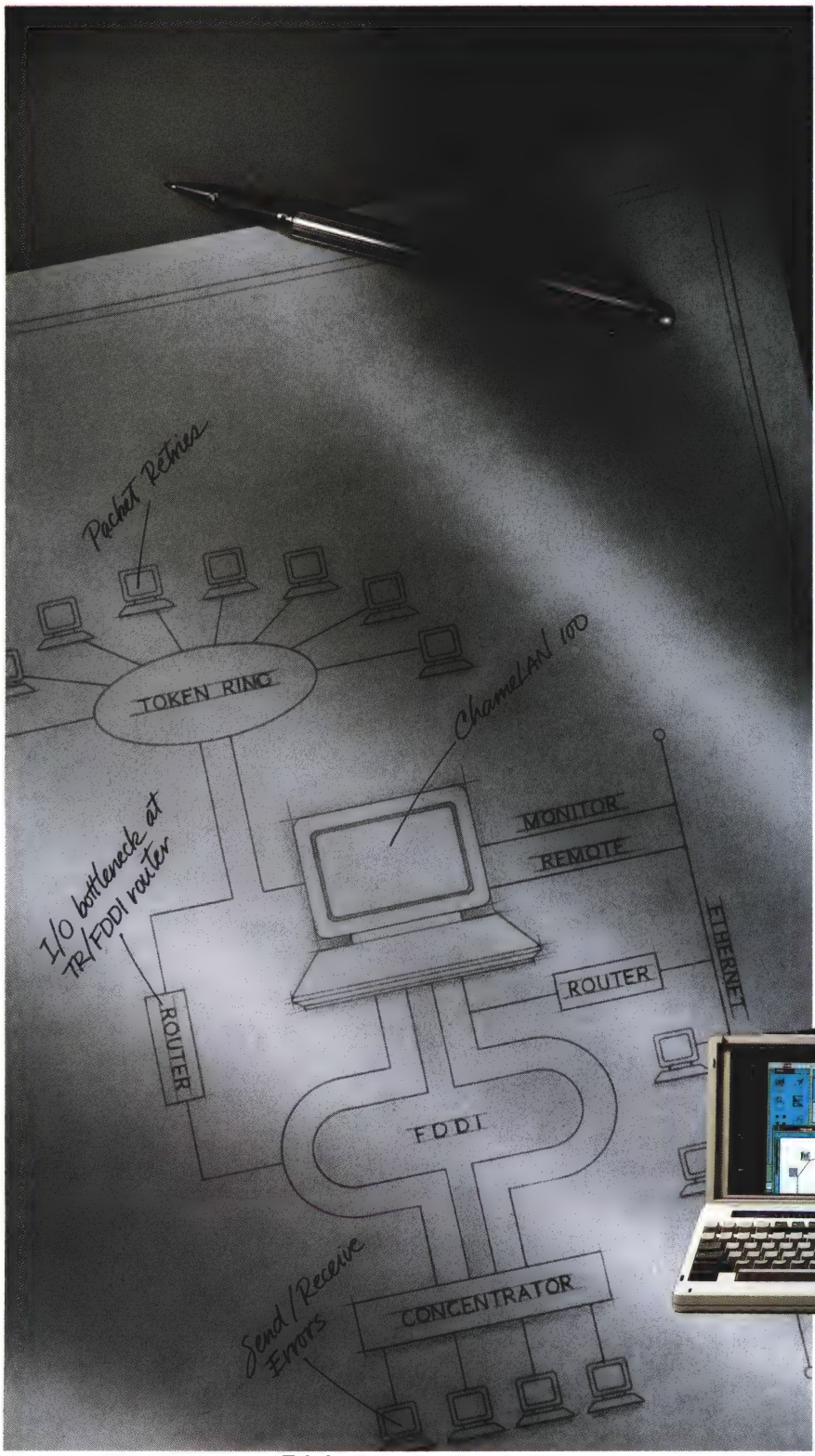
And to muddy the waters further, British Telecom and the Irish telco have chosen to call their services SHDSs (Switched High-speed Data Services) and to use much the same approach as Telecom's Fastpac, but with more alignment of the 10Mbps rate to the American SMDS standards. However, one recent trial of SHDS used to link British universities, had a distinctly central-office SMDS feel.

"We are a little confused about BT," admits Tom Templeman. "We know they are accelerating their deployment, and they'll have 65 nodes connected this year, but our understanding was that this was to be the same as Fastpac 10 with direct Ethernet and Token Ring connection. But they are now advertising SMDS compliance! We are not sure whether that means they are going down the American route, or they may try to do both — saying, in effect 'we will provide whatever you want'."

None of this is much of a problem with Fastpac in Australia because Telecom owns the whole store. However, for simple commercial reasons, Telecom's new Fastpac 2 service will now be closely aligned with Bellcore's SMDS specifications. However, there are some essential differences between Fastpac 10 and what is taking place elsewhere around the world, simply because Fastpac 10 was a very early implementation of DQDB.

Because of the exclusive territory problem, the key Bellcore SMDS service definitions are for network interfaces — at both the network/customer (CAN/CPE) boundary and at the regional carrier/interstate carrier (RBOC/IXC) boundary. The most important of these is the SIP or SMDS Interface Protocol which exists at the customer's point of entry into the CAN. Physically, this is in the CSU/DSU (Channel/Data Service Unit) box on the customer's premises.

A device so advanced, it can test things that don't even exist yet.



The ChameLAN® 100 can now test FDDI, Ethernet and Token Ring networks at full bandwidth in real time. Simultaneously. So you can identify bottlenecks between different networks. Even between two FDDI rings.

More importantly, the ChameLAN 100 can help you anticipate problems before they happen. And lets you solve them before they compromise the integrity of your network.

It does this by simulating new network conditions, such as increased traffic loads, additional workstations on your LAN, misformed frames, duplicate addresses or increased ring latency.

This simulation capability means that you can design and test network additions and changes before you physically install them, eliminating errors before you even make them.

Finally, we put it all in a friendly X Window™ environment, with the power of UNIX®. Plus we included a Ring Map Network Topology display, to show you the status of all nodes. Instantly.

No one else's analyzer can even begin to offer you this capability.

And if you find that surprising, simply consider that more people use Tekelec® FDDI analyzers than all the others combined. Find out why. Call TEKELEC, (02) 790 2200

TEKELEC

Tekelec Australia Pty Limited
Suite 14, West Court, Bankstown City Capital Centre
41-45 Rickard Road, Bankstown NSW 2200 Phone: (02) 790 2200 Fax: 790 0848

Not Quite Connectionless

The term 'connectionless' has been often bandied about in respect to 802.6 MANs, and the value of delivering data without needing to set up a circuit is well-known to be desirable for handling bursty LAN traffic. However, connection-oriented networks, which are deterministic in their delivery of packets, are generally assumed to be necessary for isochronous (real-time) voice and video services.

Async connectionless fast-packet services can handle voice and video, but they may become erratic, especially with:

- Lower packet throughput rates;
- Longer packets; and
- Non-prioritised packets.

This erratic delivery can become serious whenever the traffic begins to approach the network's peak rate. So the use of connectionless networks to carry isochronous traffic often means that the network must be over-engineered to ensure smooth regular delivery. This is the opposite of what packet-systems are designed to provide — efficient network operations at near-peak traffic loads.

'Connectionless' assumes that each unit/packet/cell travelling across the network carries its own destination address: That no preceding call-setup packets are needed to establish 'virtual circuits' for the related data-units to follow.

In this sense, at the cell level of 802.6, the DQDB technology is probably a true connectionless system: Each ATM cell has fields in the 5-byte header with space for both destination and source addresses. Each cell is transmitted and switched independently across the MSS.

However the Fastpac and SMDS implementations (and the future B-ISDN system) use only one byte in each cell for the node destination address — and a standard 8-bit byte only provides 256 variations. So each cell can only distinguish between one of 256 nodes along its path. There's a second byte which allows it to then choose between one of 256 access-points at each node — which is certainly not enough for a national or international connectionless network.

This is why the much longer E.164 addressing system of ISDN telephony is used for any packet likely to leave the local MAN, and it is this that makes DQDB both a 'cell-switched' and a 'packet-switched' technology.

When a packet from a LAN (anything up to 9,188 bytes long) arrives at a DQDB node, it is initially converted by the router to a variable-length intermediate-stage packet (called the Layer 3 PDU). At this level the router will add a 36-byte header and a 4-byte trailer. This packet is then passed over RS-232, for segmentation by the DSU/CSU (Data/Channel Service Unit) into the standard ATM cell size of 48-bytes payload plus the 5-byte header (the Layer 2 PDU).

The 'international' address is added to the data by the router at the packet level. Currently SMDS and Fastpac are using a 10-digit implementation of the standard E.164 addressing scheme, but shortly they will increase this to 15-digits. This packet-address is always carried in the payload of the first cell of each packet, and subsequent cells are then identified as belonging to that packet.

Nodes addressed by the destination bytes at the cell level will then reassemble the intermediate packet from the arriving cells and read the E.164 address — which, if you think about it, is very much like establishing short intermittent virtual circuits.

This process raises the overhead of the system to about 25% (given the packet and the cell overheads). But it creates a system which has the best characteristics of connectionless services and many of the desired attributes of connection-oriented networks.

When you add to this the DQDB feature of providing isochronous services on the MAN through regularly-spaced special time-slots, you are extending the value of this 'connectionless' system well into the realm of connection-based networks. The only problem is that most telcos are choosing not to implement these isochronous services — although they may still need to do this for SNA data delivery because of the IBM protocol's intolerance of byte delays.

Stewart Fist

The CSU/DSU and the company's own router are jointly responsible for the intermediate packet-definition of the data and for its later segmentation and reassembly, to and from, DQDB's ATM-cells. This two-stage approach allows existing routers to be used with only a software change. Many of Bellcore's problems arise because this CSU/DSU can't be provided by the telco itself as CPE: It must come from a third party under FCC regulations designed to restrict vertical market integration.

Right now, all SMDS implementations are in local RBOC areas only, although MCI has a long-haul trial that crosses the country. They are all having problems working out how to implement billing systems, and also in discovering how to manage these large connectionless networks. The RBOCs are proposing to charge a flat-usage fee based on the access data-rate contracted — simply because they don't yet know how to charge customers for usage on a 'per-byte' basis.

Billing is a hard enough problem within one RBOC's territory, but across telco boundaries the problems will compound unless all charge on a volume basis, and find some way to exchange management information and arbitrate disputes. Bellcore is specifying an InterCarrier Interface (ICI) between the RBOCs and the IXCs (specified but not yet implemented in the switches) and an Inter-Switching System Interface (ISSI) for different vendor equipment. But this standard is still in the specification stage, so there are bound to be problems here.

On the question of isochronous services, there's room for dispute also. Australia and the RBOCs have chosen to nobble the technology by allowing data-only over their networks, even though DQDB was specifically designed for both real-time and non time-sensitive traffic. However SNA data (and this is still currently the most transported data protocol) requires an 'almost isochronous' service, and this might eventually force the telcos to implement the full protocol stack. There's a suggestion that MCI may implement isochronous services, and this would be a threat to the RBOCs monopoly of local phone services in some cases.

Fast Enough?

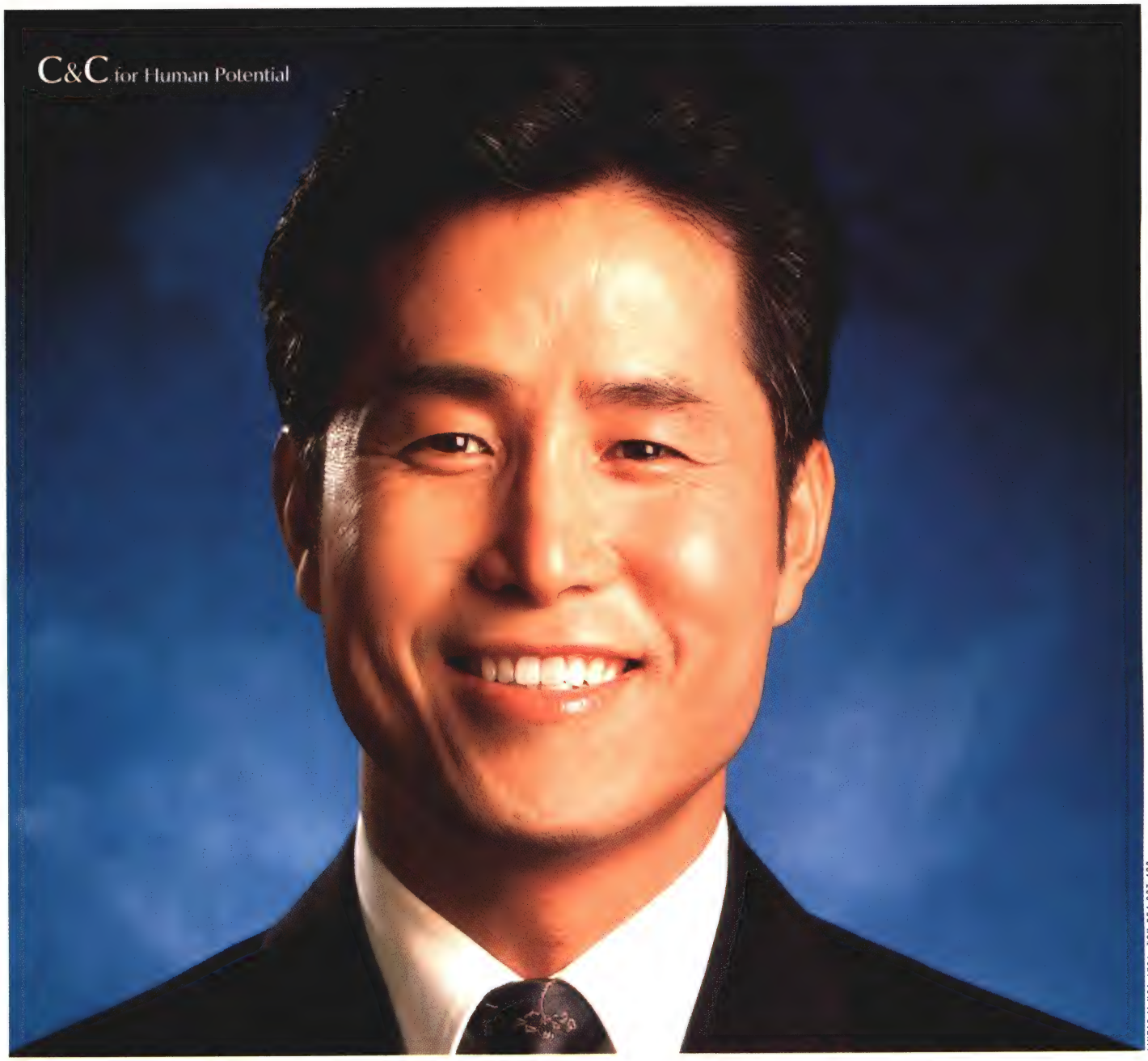
Australia and the UK are concentrating on the lower-speed 2 and 10Mbps access rates, while the US and Europe are allowing interfaces as high as 45Mbps now, and are talking about 140, 155 and 622Mbps in the near future. QPSX says that Telecom's 10Mbps rate is upwardly flexible, so it is certainly possible for them to extend Fastpac to 45Mbps shortly — but it is hard to see what applications need these rates.

The five 'Classes' of access on SMDS (4 to 34Mbps without overhead) are all carried on the same DS-3 45Mbps link from customer to exchange. The Classes are differentiated by a 'credit counter' which is built into each CAN to limit the data-rate. Bursts exceeding the contracted rate are permitted for Class 1 to Class 5 (but only a few percent above the contracted 'class' rate).

However the lowest rate (1.17Mbps — presumably Class 0) in America is not allowed to exceed the contracted rate. Australia's 2Mbps Fastpac 2 will be the same.

So far, the American RBOCs are only delivering the lowest 1.17Mbps access rate around the country, but everyone is tariffing the higher rates of Classes 1 to 5 (1.17, 4, 10, 16, 34Mbps) which are due soon.

Europe appears to be lagging behind America and Australia in converting its early DQDB trials to tariffed services. There's a deep division between the countries. The UK is possibly following Australia's lead to a degree, while some MAN-type loops are also being installed in Germany and Den-



LINTAS M NCA 4781 ACN 004 805 490

Trust the insides of your PABX to someone who knows it inside out.

Your phone system is the lifeline of your business and is too important to trust to just anybody.

NEC, a leader in communication technology, has developed NECARE, a highly reliable Australia-wide service, designed to ensure that your PABX operates efficiently at all times. Naturally, being the designers and manufacturers of your NEC PABX allows NEC to offer you the security of NECARE's experienced and highly knowledgeable staff.

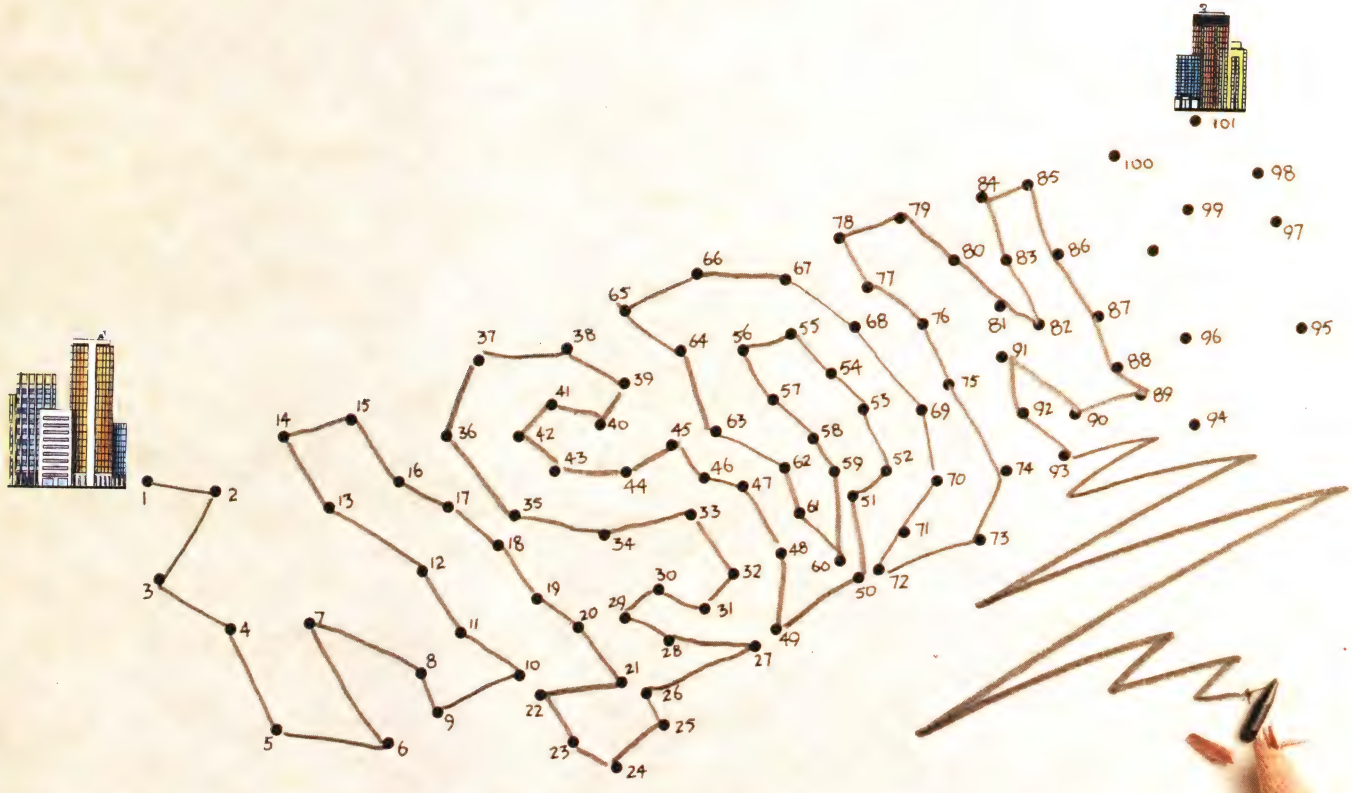
The beauty of a NECARE agreement is that it's inherent flexibility allows you to tailor a package that suits your specific needs. So why trust an outsider, when NEC knows your NEC PABX inside out.

NEC

NECARE

HEAD OFFICE (03) 262 1111. VICTORIA (03) 262 1111. NSW (02) 930 2000. SA (08) 372 4900. WA (09) 220 5555. QUEENSLAND (07) 251 3333. ACT (06) 250 8777.

Why play games with your communications system



when there could be a better path to follow...

... Q-Net Australia.

For most business users, the current carrier services can present a torturous and sometimes costly path to completion. As a facilities manager we understand the strengths and weaknesses of the Carriers products, the available hardware options and service delivery.

While we compete against the main carriers and hardware vendors, we also use the best that they and others have to offer.

Through our expertise, we are able to offer our clients the best combination of technologies and deliver 15% to 25% savings on their current network costs – with no capital outlay.

If this sounds too good to be true, allow us to conduct a no obligation audit of your current system. We'll prove the benefit of selecting the most appropriate paths to follow.

Q-NET

AUSTRALIA

POINTING YOU IN THE RIGHT DIRECTION

BRISBANE (07) 852 1414 SYDNEY (02) 267 4884 MELBOURNE (03) 526 3506

GCA4817

SMDS Specifications

The IEEE 802.6 specifications are not always implemented in full in SMDS systems. For instance, SMDS does not currently use DQDB's queuing protocols in the CAN, since its connections are always point-to-point and single user. However, the protocol has been included to allow multiple user-channels in the future.

One reason why SMDS has been widely accepted in the US is that Bellcore has virtually dictated a single common set of service standards. Unlike ISDN and frame relay, there is little room for individual variations which could delay future interoperability.

In addition to the base 802.6, Bellcore has added specifications for:

- The management of SMDS networks;
- Ways in which billing information should be created;
- How billing information must be transferred and administered; and
- Security measures such as techniques for validating and screening messages based on the addresses of packets entering and leaving the network.

Bellcore also specifies a range of access rates (called 'classes') and it limits the features which each class must provide. Class 0 (1.54Mbps), for instance, does not have the ability to handle bursts above the set data-rate limit; while Classes 1 to 5 (which are all carried on DS-3 links) are allowed to burst at higher rates than their contracted data-rate. The Bellcore specification calls for a 'credit counter' which keeps track of these data rates, and throws away any cells in excess.

It is important to realise that the current SMDS approach does not specify which core technology central office switches use in the network, or for bearer traffic between switches. So SMDS, in the US context, is really only a CPE access-protocol: It is assumed that the core network will later migrate to ATM switching, and later still to full B-ISDN, and that SDH/SONET will be used for bearers.

The present SMDS implementations are all for MANs within the same telco's operational area, although interoperability has been demonstrated a couple of times. Earlier this year, Bellcore released the standard for the ICI (InterCarrier Interface) essential for inter-LATA (Local Access Transport Area) connections; under FCC regulations one RBOC can not deal with another adjacent company direct, but only through an Inter-eXchange Carrier (IXC) like AT&T.

Provided agreements can be reached over 'ownership of customers' and some management issues, the local SMDS services in America will soon begin to cross the LATA boundaries and be linked by the IXCs across the country. MCI is already doing this, but only for its own customers using leased lines to gain direct (bypass) access to customers in RBOC territory.

At some time early in 1994, Bellcore will have completed the specification for ISSI (Inter Switching Systems Interface). This is for a problem which is already being partly solved at the vendor level by cooperative agreements. However there are problems with different vendors using different backbone protocols, and these will need to be solved before they are truly able to interoperate and exchange billing and management information.

The new ISSI specification will become more important as the future migration to ATM switches begins.

Stewart Fist

mark — usually using equipment made by Alcatel, although there's still some original QPSX gear around. The Scandinavian countries and the US are tending to use Siemens gear, while the French seem to be totally opposed to the DQDB push, and are moving directly to ATM-switching.

So the market is in a constant state of flux. In March, the SMDS Interest Group (not Bellcore) approved a standard for 54-Kbps and 64Kbps frame relay access to SMDS over 1.54Mbps access lines. Frame relay switches are more reasonably priced than SMDS switches, and this new standard bypasses the expensive CSU/DSU boxes.

QPSX has also released its new chip-set which will handle cell packetisation up in the 622Mbps range. These chips will eventually find their way into PC cards which will be able to output either DQDB-cells or pure ATM-cells direct, bringing DQDB and later ATM right up to the desktop.

Strictly then, the link between SMDS and DQDB/802.6 is that, currently, this is the only practical standard with functioning switches which satisfies Bellcore service requirements. Bellcore likes to emphasise that SMDS is technology independent so

Continued on page 85

Fastpac: Comparing the Cost

Telecom Australia's new Fastpac service provides high speed bridging of LANs over metropolitan and countrywide distances via 2Mbps and 10Mbps access classes. Each access class supports both 802.3 Ethernet and 802.5 Token Ring interfaces. Based on technology designed by Australian company QPSX, Fastpac facilitates high speed customer interfaces, by using fast packet switching at speeds of up to 140Mbps between Telecom exchanges. (A detailed technical explanation of Fastpac technology can be found in 'Fastpac — Nationwide High Speed Networking,' in the March 1991 edition of *Australian Communications*.)

Fastpac is presently available in three configurations: Fastpac 10, which provides a 10Mbps service supporting up to eight Ethernet or Token Ring interfaces (but note, however, that users with more than one interface per service must share the bandwidth of the service piecemeal); Fastpac 2, which offers the same service at 2Mbps; and an open 2Mbps packet interface, allowing the connection of third-party customer premises equipment directly into the Fastpac network. Equipment of this kind is already being developed by vendors such as IBM and Datacraft. The Fastpac service is fully network managed by Telecom via SNMP.

Fastpac 2 and Fastpac 10 are likely to cater for the biggest demand. The Ethernet and Token Ring interfaces provide remote LAN bridging functions as part of the service and there is no need for users to buy third-party bridges or routers. Users with a Fastpac 10 interface are also able to communicate with LANs connected to Fastpac 2, and vice versa. However, the LAN-to-LAN connectivity only applies to like interfaces, that is, only Ethernet-to-Ethernet or Token Ring-to-Token Ring. As yet, there is no 'Fastpac 16' service for the interconnection of 16Mbps Token Ring LANs available, but Telecom does have it under consideration.

Fastpac 10 was launched in September 1992 and is presently only available in the local call areas of Sydney, Melbourne, Canberra and Brisbane. Other cities are likely to come on-line when demand for the service increases. Fastpac 2 has recently been launched and is available anywhere in Australia where reliable 2Mbps transmission is accessible. However, areas outside the local call areas of Sydney, Melbourne, Canberra, Brisbane, Adelaide and Perth, incur an additional 'Non-Prescribed Area' annual access charge.

Each user of Fastpac is given a unique Closed User Group (CUG) address which identifies interfaces on the Fastpac network, in effect enabling the establishment of a secure Virtual Private Network. Inter-company communications are feasible, as each Fastpac interface may contain several individual and broadcast CUG addresses.

The ability to utilise Fastpac for the high speed bridging of LANs provides a platform for the introduction of a number of applications, such as electronic mail, large file transfer, database access, transaction processing, image transferral and remote network management. At present, Telecom has positioned Fastpac in the data communications market only, and it cannot currently be used for voice communications or videoconferencing.

Alternative Technologies

Fastpac is used primarily to send high speed LAN data within and between Australian capital cities. Because of this, it competes in a number of market segments. For short distance LAN-to-LAN bridging, a number of different technologies could be considered competitors.

For example, optical fibre may be used to extend an Ethernet link using the IEEE 10Base-FL Fibre Optic Inter-Repeater Link (FOIRL) standard. Under the Austel '500 Metre Rule,' two locations may be connected by private cabling if they both are utilised by the same organisation, and the length of the cable laid is 500 metres or less.

Laser beam links such as the TeraBeam E10 and E16 from ADE Network Technology can be used to interconnect Ethernets or Token Rings if there is 'line of sight' and the distance between two sites is 1,000 metres or less. The E10 provides an Ethernet repeater link and may require third-party local bridges, depending on the situation. Different models of the E16 can incorporate repeater or bridging functions. Laser Beam units providing lower speed V.35 interfaces up to 2Mbps are also available.

For distances up to 12 kilometres, 18 GHz or 23 GHz microwave links providing 2Mbps and 10Mbps interfaces may be employed between locations with line of sight. If line of sight is not available, either active or passive repeaters may be used, but at an increased capital cost. Rental of rooftops may also be applicable in some circumstances, adding to the annual cost.

A fairly typical microwave system includes the microwave units, parabolic antennae, waveguides and Ethernet transceivers. Third-party bridges are required to connect a LAN to a microwave system, and V.35-to-G.703 converters may be needed to interface remote bridges to 2Mbps microwave systems. An annual DOTAC licence is also payable to obtain use of microwave frequencies.

For intra- and inter-city LAN-to-LAN communications, the Fastpac service competes with alternative Telecom data services. However, no high speed (10Mbps or higher) services currently exist for either market. Telecom's Megalink service provides a raw 2Mbps bandwidth which may be broken up into voice and data channels if required. It competes with Fastpac 2 in both the intra- and inter-city market segments, and provides an alternative to Fastpac 10 countrywide. Additional equipment (bridges, V.35-to-G.703 converters) is required to facilitate the use of Megalinks for LAN interconnection. For the Megalink service there is an initial installation cost, and an annual access cost which is dependent on the distance of the link.

Telecom's Integrated Services Digital Network (ISDN) Macrolink Primary Rate product provides separate N x 64Kbps channels which may be used for either voice or data communications. These channels may be aggregated to provide higher bandwidths (most typically at 128Kbps, 256-Kbps or 384Kbps) to provide LAN-to-LAN connectivity. However these speeds are much lower than the bandwidths offered by Megalink or Fastpac. Telecom does not see ISDN as competing against Fastpac in the LAN interconnection market, since ISDN is primarily used for voice and data circuit switching.

In addition, Telecom data services such as DDS, Flexnet and Austpac (X.25) can operate at speeds up to 64Kbps, but their lower speeds suggest that in the overall market they will not provide serious competition to either Fastpac or Megalink.

Technologies like optical fibre links, laser beam units and microwave systems incur a relatively high initial capital cost, and then a lower annual maintenance cost (which may typically be 5% of the capital cost). However, once the equipment is purchased, the user does not need to pay anything extra and the equipment is an asset to the firm. Telecom services incur an initial installation cost, an annual rental cost for the lifetime of the service, and occasionally a usage charge.

As far as the other service providers are concerned, at present there is little available to compete with Fastpac. Optus Communications plans to have DDS-like services by mid-1993 and ISDN by the beginning of 1994, but is still putting the infrastructure in place. AAP Telecommunications on-sell products like Megalink but not as yet Fastpac, while international carriers such as BT provide frame relay services from Sydney to some overseas destinations, but no domestic reticulation of the service within Australia.

FASTPAC TARIFFING

Fastpac tariffing has three components: An up-front cost; an annual rental cost; and a usage cost.

The initial connection fee is for the network terminating unit (NTU) and line, and covers all Ethernet and Token Ring interfaces to Fastpac installed at that time. In other words, obtaining two or more Ethernet or Token Ring interfaces to Fastpac incurs the same initial cost as only one. There is, however, a fee for each subsequent interface added to Fastpac after the service is commenced.

The annual Fastpac rental cost has two parts: A fee for the rental of the NTU and line; and a fee for the rental of each Ethernet interface, Token Ring interface, or 2Mbps packet interface employed. Customer premises equipment for the 2Mbps packet interface is also available from Telecom. Fastpac 10 is not available outside prescribed areas and an additional access rental fee is charged to Fastpac 2 users located outside prescribed areas. Prescribed areas are defined as the local call zones of Sydney, Melbourne, Canberra, Brisbane, Adelaide and Perth.

The third Fastpac tariff component is a distance-based monthly usage charge based on five charge zones. There are traffic volume-based savings available.

Telecom also has on offer an alternate monthly usage charge called Volume Link, which treats two sites as though they are at each end of a point-to-point link. The Volume Link charge is based on the distance between the sites (i.e. the charging zones) and the cumulative amount of data sent on that link in a month (i.e. the charge covers all the data sent between two sites in either direction). This option provides a steeply diminishing cost per megabyte as traffic levels increase. Volume Link charges are capped for traffic levels over 2,256,000 MB/month.

Fastpac Connection Fees

	Fastpac 2	Fastpac 10
NTU and Line	$4,000	$9,000
Additional Interface (each)	$250	$250

Fastpac Annual Rentals

	Fastpac 2	Fastpac 10
Access Rental	$13,500	$48,864
Non-prescribed area charge	$14,760	N/A
IEEE 802.3/5 Interface Rental	$4,500	$9,276
2Mbps Packet Interface	$1,920	
2Mbps Packet Interface + CPE	$4,500	

Fastpac Usage Charges

MB per service per month	Zone 1 0 - 3 km	Zone 2 3 - 50 km	Zone 3 50 - 500 km	Zone 4 500 - 800 km	Zone 5 over 800 km
0 - 7,200	$0.09	$0.18	$0.79	$1.40	$1.56
7,201 - 14,400	$0.07	$0.14	$0.58	$1.04	$1.16
Over 14,400	$0.05	$0.10	$0.45	$0.80	$0.89

Fastpac Volume Link*

MB per service per month	Zone 1 0 - 3 km	Zone 2 3 - 50 km	Zone 3 50 - 500 km	Zone 4 500 - 800 km	Zone 5 over 800 km
up to 20,000	$425	$850	$3,673	$6,513	$7,270
20,000 - 40,000	$514	$1,028	$4,368	$7,745	$8,645
40,000 - 80,000	$622	$1,244	$5,123	$9,084	$10,139
80,000 - 160,000	$753	$1,506	$5,926	$10,507	$11,728
160,000 - 320,000	$911	$1,822	$6,760	$11,987	$13,379
320,000 - 640,000	$1,102	$2,205	$7,819	$13,865	$15,475
640,000 - 1,280,000	$1,334	$2,668	$9,170	$16,261	$18,150
1,280,000 - 2,256,000	$1,614	$3,228	$10,905	$19,338	$21,584
Over 2,256,000	$1,953	$3,906	$13,059	$23,157	$25,668

*Monthly charge based on the cumulative traffic per month between two sites

Fastpac vs The Rest

How does Fastpac compete on cost with these alternatives? To test the cost-effectiveness or otherwise of Fastpac, the analysis which follows examines three different service requirement scenarios: Across the street; across the city; and across the country. For each scenario discussed below, the technologies or services are selected, then an up-front and annual cost are calculated for each. The costs are then extrapolated over five years via a discounted cash flow analysis.

- **Across the Street**

The first scenario involves a firm with three offices located in close proximity, either in adjacent buildings or across the street from one another. All offices are within 500 metres of each other and are in the same exchange area. There is an Ethernet LAN in each office which must be interconnected to the other two LANs in a redundant fashion (i.e. two remote connections per site are required). For the purpose of analysis, the cumulative data on each link is 5,000 megabytes (MB) per month, which is an average of about 28 MB/hour for a 22-day month.

Megalinks, optical fibre, laser and microwave links all compete with both Fastpac 2 and 10 in this scenario. All employ point-to-point links to give the triangular network topology required and all require additional CPE, such as transceivers, bridges and interface converters. It should be noted that the bandwidth offered by Fastpac 2 and Megalink solutions is 2Mbps and the optical fibre, laser links, microwave links and Fastpac 10 all provide 10Mbps bandwidth.

With Fastpac, only one Ethernet interface per site is necessary and no additional CPE, such as bridges, are required. As the cumulative throughput between two sites is greater than 4,500 MB/month, Fastpac usage charges are based on the Volume Link option.

The up-front and annual costs for the provision of the LAN interconnection using the technologies identified are summarised in Table 1. Solutions employing optical fibre, microwave and laser links all have a relatively high initial cost and a much lower annual cost, compared to the Telecom services, where the reverse is true. The annual cost and discounted cash flow analyses over five years are shown in Figures 1a and 1b respectively on page 83.

Looking at these costs over five years, the optical fibre link becomes the most cost effective immediately, due to its relatively low up-front and annual costs. The Megalink solution is also cheaper than Fastpac 2

Fastpac: Comparing the Cost (cont.)

over this time frame. Both the Megalink and Fastpac 2 solution start out cheaper than the laser link, but the cumulative cost is higher after five years. The microwave solution does not really look attractive due to its high start-up cost but after five years the cumulative cost is approximately the same as Fastpac 2. Fastpac 10 is far too expensive as its relatively high annual cost does not make it competitive after more than one year.

So for this scenario, LAN interconnection using the non-Telecom solutions (optical fibre, laser beam units and microwave systems) quite clearly provide the most cost-effective solution.

- **Across the City**

The second scenario involves a small business operating in a city's metropolitan area. It has two main offices located approximately 8-10 km apart, and eight branch offices. The distance from a branch to a main office is no more than 10 km. Each branch sends its business data to the main office closest to it but occasionally needs to send data to other branches. The cumulative data on a branch office to main office link is assumed to be 8,800 megabytes per month, or 50 MB/hour. The two main offices need to communicate with each other and also act as a trunk for connecting the branches. The cumulative data on the main office link is 36,000 megabytes per month, or 204 MB/hour.

It is required that the two main offices be connected with a 10Mbps bandwidth link and that each branch has a 2Mbps bandwidth link to its main office. As the two main offices have line of sight, a 10Mbps microwave link is a feasible option, and because the firm owns all its buildings outright, it does not need to rent any third-party rooftop space. Megalinks are to be used to link the branches to their respective main office. This solution requires the same CPE for microwaves and Megalinks as for the first example.

Likely Fastpac usage tariffs for this scenario are again calculated using the Volume Link option. A summary of the upfront and annual costs of each solution is given in Table 2. The annual cost and discounted cash flow analyses over five years are shown in Figures 2a and 2b respectively.

As expected, the microwave/Megalink solution has a much higher up-front cost than the Fastpac solution, due to the large CPE investment needed. Fastpac, on the other hand, costs slightly more per annum. However, after five years the Fastpac solution is still the cheaper of the two.

It is important to note that if the two main offices did not have line of sight or were, for example, 20 km or more apart, the cost of a microwave link to connect them would be much greater, while the cost of Fastpac would remain unchanged.

- **Across the Country**

The final scenario concerns a national firm with main offices in Sydney, Melbourne and Canberra, and other offices in Brisbane, Adelaide and Perth. Each office has a Token Ring LAN. The offices in Sydney, Melbourne and Canberra send information to each other quite regularly and require as much bandwidth as is available. The other offices take the shortest path to the nearest main office.

The three main offices send equal amounts of data to each other, a cumulative total of 50,000 megabytes per month, or 284 MB/hour, from each office to the other two. The link between each minor office and its endpoint carries 10,000 megabytes per month, or 57 MB/hour. As with previous scenarios, this configuration requires the purchase of extra CPE, for example, bridges and V.35-to-G.703 converters.

With Fastpac, there are two possible configurations: Using Fastpac 10 on all links; or employing Fastpac 10 in Sydney, Melbourne and Canberra, and Fastpac 2 in Brisbane, Adelaide and Perth. A typical Megalink solution would feature point-to-point links between cities along the Eastern seaboard, and direct Melbourne-Perth and Melbourne-Adelaide links.

Fastpac usage tariffs are calculated using the Volume Link option based on a point-to-point configuration (i.e. Perth to Melbourne, Brisbane to Sydney, etc.). The up-front and annual costs of all three solutions is given in Table 3. The annual costs and discounted cash flow analyses over five years are shown in Figures 3a and 3b respectively. As observed from Figure 3b, both Fastpac solutions offer significant cost savings over the Megalink alternative, while also providing additional and more efficient use of bandwidth.

These simple scenarios show that Fastpac is best suited to interconnect LANs interstate. For LAN interconnection in the metropolitan area, Fastpac is only cost-effective where alternate technologies are not available, or the geographical distance between sites is large. Clearly, these are the market segments targeted by Telecom. In addition, over very short distances, alternatives to Fastpac will most likely continue to provide the most cost-effective solution for a number of years.

David Uren is a Senior Consultant with Consultel Australia, based in Perth. *He acknowledges the assistance given to him by Telecom Network Marketing and Expertlink.*

METHODOLOGY

The cost analyses presented here compare Fastpac with alternative services in two ways: Annual cost and discounted cash flow (DCF). In each case, the calculations include installation costs, customer premises equipment (such as bridges) costs, and, where appropriate, usage charges.

A discounted cash flow or net present value (NPV) analysis provides an investor with an idea of the likely worth of his investment over a period of time. A DCF discounts the expected future payoff of a capital investment by the rate of return offered by a comparable investment alternative (e.g. bond interest rates). The rate of return is often termed the *discount rate* and is the opportunity cost of the investment.

A commonly used way to calculate the DCF is by multiplying the annual cost by an *escalation factor* to account for the effects of inflation; and reducing the result by the discount rate. In these examples an inflation rate of 5% and a discount rate of 12% have been applied, giving an *effective* discount rate of 7%.

Table 1: Scenario #1 Cost Summary

Solution	Initial Cost	Annual Cost
Fastpac 2	$12,000	$69,300
Megalink	$37,210	$42,528
Fastpac 10	$27,000	$189,720
Laser Links	$135,000	$15,750
Microwave Links	$219,000	$25,350
Optical Fibre	$61,500	$3,075

Table 2: Scenario #2 Cost Summary

Solution	Initial Cost	Annual Cost
Fastpac 2/ Fastpac 10	$50,000	$354,216
Megalink/ Microwave	$289,840	$319,080

Table 3: Scenario #3 Cost Summary

Solution	Initial Cost	Annual Cost
Fastpac 2/ Fastpac 10	$39,000	$703,932
Fastpac 10 on all links	$54,000	$824,352
Megalink	$375,270	$1,142,565

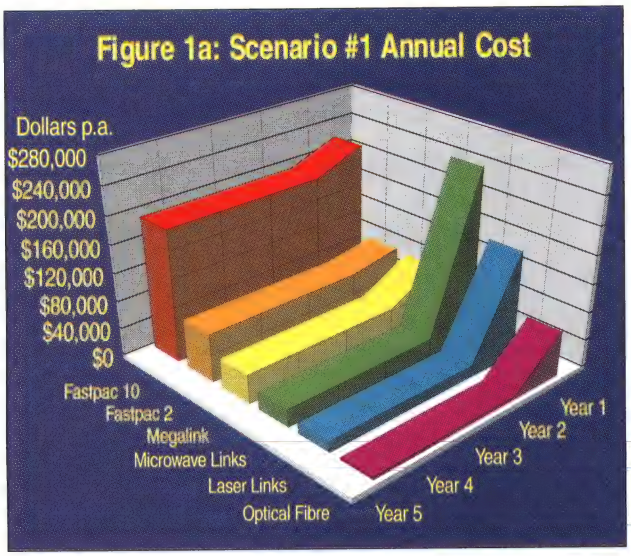


Figure 1a: Scenario #1 Annual Cost
Dollars p.a.
$280,000
$240,000
$200,000
$160,000
$120,000
$80,000
$40,000
$0
Fastpac 10
Fastpac 2
Megalink
Microwave Links
Laser Links
Optical Fibre
Year 1
Year 2
Year 3
Year 4
Year 5

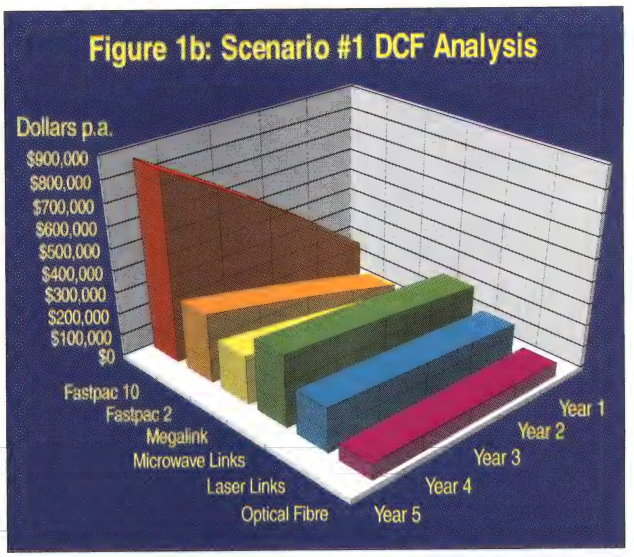


Figure 1b: Scenario #1 DCF Analysis
Dollars p.a.
$900,000
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
Fastpac 10
Fastpac 2
Megalink
Microwave Links
Laser Links
Optical Fibre
Year 1
Year 2
Year 3
Year 4
Year 5

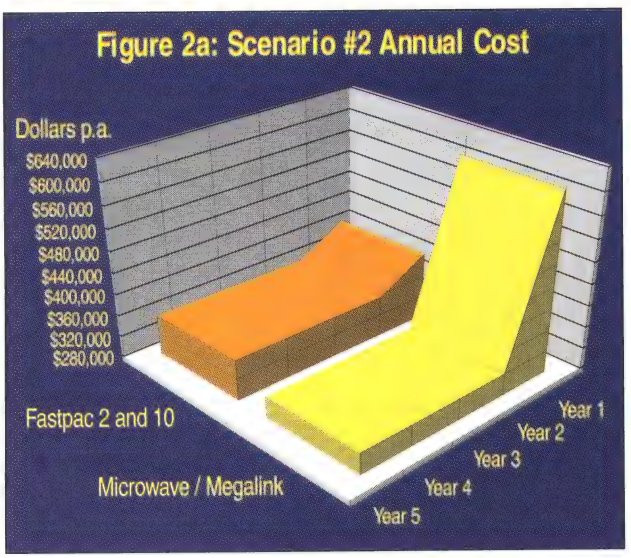


Figure 2a: Scenario #2 Annual Cost
Dollars p.a.
$640,000
$600,000
$560,000
$520,000
$480,000
$440,000
$400,000
$360,000
$320,000
$280,000
Fastpac 2 and 10
Microwave / Megalink
Year 1
Year 2
Year 3
Year 4
Year 5

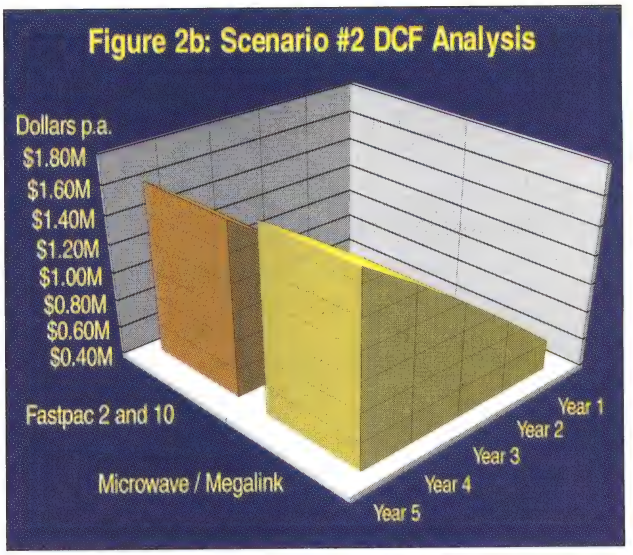


Figure 2b: Scenario #2 DCF Analysis
Dollars p.a.
$1.80M
$1.60M
$1.40M
$1.20M
$1.00M
$0.80M
$0.60M
$0.40M
Fastpac 2 and 10
Microwave / Megalink
Year 1
Year 2
Year 3
Year 4
Year 5

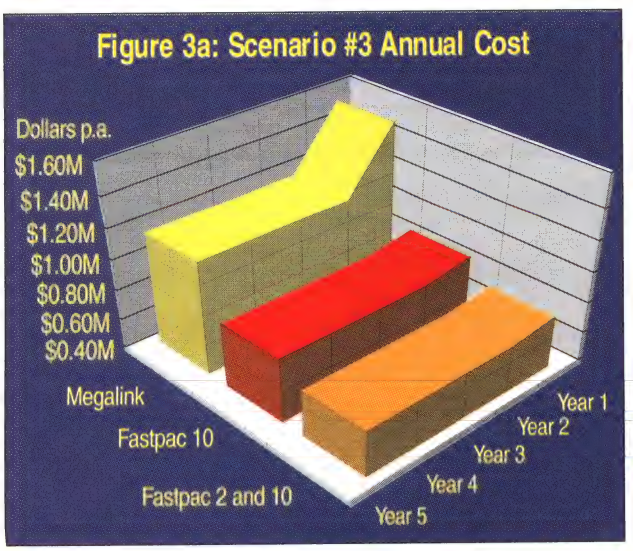


Figure 3a: Scenario #3 Annual Cost
Dollars p.a.
$1.60M
$1.40M
$1.20M
$1.00M
$0.80M
$0.60M
$0.40M
Megalink
Fastpac 10
Fastpac 2 and 10
Year 1
Year 2
Year 3
Year 4
Year 5

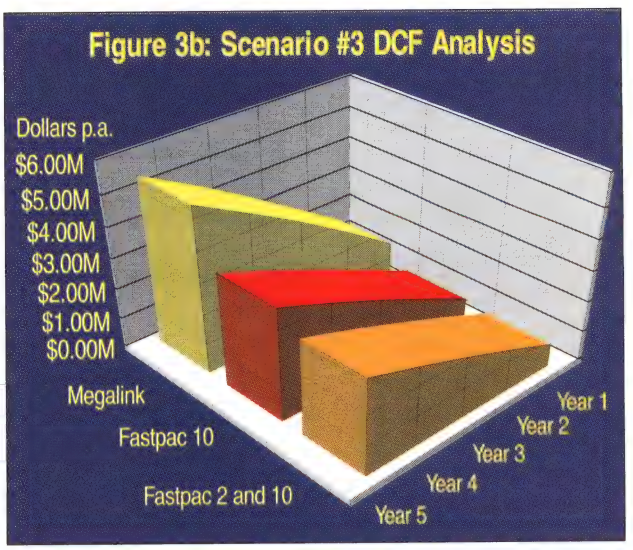


Figure 3b: Scenario #3 DCF Analysis
Dollars p.a.
$6.00M
$5.00M
$4.00M
$3.00M
$2.00M
$1.00M
$0.00M
Megalink
Fastpac 10
Fastpac 2 and 10
Year 1
Year 2
Year 3
Year 4
Year 5

All call queuing systems need a voice!

madam is a sleek Call Queue Announcer that will transform any PABX or dedicated ACD switch into the ultimate queuing system.

Put simply, **madam** is a multiple line digital Recorded Voice Announcer or (RVA) that puts ***you*** in control.

Multiple announcements for Agent or Operator queues can be remotely recorded and replayed from any telephone in your system.

Each Agent Group may customise their own welcome and repeat announcements by entering a PIN code into **madam's** user friendly voice prompted menu system.

The addition or deletion of Agent Groups on your PABX or ACD Switch can be achieved very simply with **madam's** expandable modular structure.

No other RVA on the market can boast **madam's** features for price. Some start out cheaper but are not expandable.You'll pay much more in the long run. Others can't handle multiple announcements for those companies that service a number of groups on the one PABX.

madam represents the best of Australian Made, and is excellent value for organisations that want to put technology to work, cost effectively.

008-809-359 ***(Free Call)***

or Phone (02) 964 9555 Fax (02) 964 9988

Ycom

Excellence in Telecommunications.....

Ycom Pty Ltd A.C.N. 056 218 887 PO Box 156 Crows Nest NSW 2065

* **madam** is the trademark of Dynamic Technology Pty Ltd.

From page 79

that SMDS planners can upgrade the technology while providing consistent service to customers. But in defining SMDS for the RBOCs, Bellcore has also had to specify a range of other features not in the DQDB standard. For instance, it has specified 'data units' of up to 9,188 bytes, which allows SMDS to encapsulate entire packets directly from Ethernet, Token Ring or FDDI. It has also decided to use the international E.164 addressing system (as has Fastpac), and provided for the creation of logical private networks through address screening and validation.

The ability to broadcast to a number of stations on a network is part of the DQDB standard, but Bellcore has specified how that group-addressing will be done over interconnecting MANs around the world.

Security is also part of the SMDS specification, and the management of virtual private networks and closed user groups is made possible through the fact that address tables are kept at each switch, and both source and destination addresses of packets are checked against these tables to filter unwanted material.

These filtering processes are being implemented now at the local switch level, but with ATM and B-ISDN they will need to shift into a more generalised intelligent network directory structure.

B-ISDN and ATM networks are connection-oriented; you'll generally set-up a call before transmitting data, but there's an 'adaptation layer' which exists between the user's applications and the ATM-cell structure. This layer will partition and modify incoming packets in various ways, according to the type of service needed (currently four variations are defined), and one of these will provide connectionless services.

DQDB MANs have the advantage of being connectionless; we don't need to monopolise circuits or bind the other party into sharing an exclusive connection before we send each unit of message — everyone sends and everyone listens on the same shared circuit. However, with connectionless systems in the public arena, the telcos have new problems with designing usage-billing techniques. SMDS specifications call for each packet to be tracked at each transition node — creating gigabytes of information which then needs to be transported, stored and filtered to extract billing information.

And with connectionless networks there will be problems with management systems: How do you trace faults when each datagram may be taking a different route through a shared national network? The problems may be ephemeral and untraceable, with each company blaming the other.

According to Pam Small of MCI, this is precisely the reason why SMDS interconnection is temporarily stalled in the States. About five RBOCs have tariffed SMDS services within their own LATA (Local Access and Transport Area) and MCI has a coast-to-coast loop with 300 nodes coming on line mid-year, but no one is yet joining their network to anyone elses'.

MCI is reusing its 'frame-relay' network (which it wisely built on a DQDB foundation), but it won't be releasing SMDS tariffs before mid-1993, and will make connections to each customer via leased lines.

"From the viewpoint of the RBOCs and the Inter-eXchange Carriers, it is also often difficult to decide what company 'owns' which customer," Pam Small explains.

She also points to problems not directly associated with the SMDS definition: "The RBOCs and IXCs have got to decide how to manage the service for the customer: Who authenticates the customer and the message recipient, and who collects payment for the services? And how?"

Stewart Fist is a freelance journalist based in Lindfield (NSW).

SNA OVER LAN – MAKING THE MOST OF EXISTING RESOURCES

RAD Offers the Key to Successful SNA/LAN Integration: Freedom of Choice

With RAD's new family of standalone SNA/LAN converters, you can now migrate your SNA/SDLC devices to multiprotocol LAN backbones without being locked into one particular internetworking strategy.

Supporting Token Ring and Ethernet, RAD's products enable seamless SNA/LAN transport by converting data from cluster controllers, FEPs and other SDLC devices into Logical Link Control (LLC 2) packets and vice versa. You can integrate your SNA traffic over a faster, more robust LAN/WAN backbone.

Consider the benefits of using RAD's standalone converters:

- *Eliminate dedicated SDLC lines*
- *Save on upgrade of IBM-3174*
- *Connect IBM-3274 to LAN*
- *Substitute cost-effective converters for pairs of bridges*
- *Local SDLC polling saves WAN bandwidth*
- *Route SNA/SDLC traffic over IP backbone using any major vendor's router*
- *Save on management costs (and NCP fees)*
- *Upgrade SDLC link speed*

Why be tied to a single vendor solution when RAD offers you the freedom to choose the most cost-effective migration strategy?

SNA/LAN Product Family

STC	*Controller to Token Ring converter, supports up to 2 lines and 15 controllers*
FTC	*FEP to Token Ring converter, supports up to 15 PU type 2.0 LAN connected devices*
SEC	*Controller to Ethernet converter*
FEC	*FEP to Ethernet converter*
RR-STC	*RADring hub module SDLC to Token Ring converter. Full hub supports 10 STC-2 modules, linking up to 150 PU type 2.0 devices*

RAD

data communications

Intl. Headquarters
Rad Data Communications
8 Hanechoshet Street
Tel Aviv 69710, Israel
Tel: 972-3-6458181
Fax: 972-3-498250

Australia
Dataplex Pty Ltd.
P.O. Box 526
234 Whitehorse Rd.
Blackburn 3130, Victoria
Tel: (03)210-3333
Fax: (03)210-3399

Dataplex (Sydney)
Level 6, Eastgardens Office Tower
Bunnerong Rd. & Wentworth Ave.
Pagewood, N.S.W. 2035
Tel: (02)349 3911
Fax: (02)349 7747

New Zealand
Dataplex (N.Z.) Ltd.
Tel: (09)307 8139
Fax: (09)377 4743

Argentina (1)3314276, **Australia** (3)2103333, **Austria** 222.601011698, **Belgium** (15)290400, **Brazil** (11)8875544, **Bulgaria** (2)725010, **Canada** 416-477-9977, **Chile** (2)5568390, **China** (1)2028393, (852)8922288,**Colombia** 6110111, **Cyprus** (2)449171, **Czech Republic** 422-366251, **Denmark** (42)919555, **Egypt** (2)735415, **Finland** 0 8036033, **France** (1)47118300, **Germany** (89)3189910, (89)716068 **Greece** (1)6547400, **Hong Kong** 5617700, **Hungary** (1)186-8004, **Iceland** (1)681665, **India** (11)2243092, (812)333415, **Ireland** (1)619066, **Israel** (03)6458181, **Italy** (2)27422565, **Ivory Coast** (225)322751, **Japan** 3.52757910, **Korea** 972-3-6458181, **Macau** 853-336676, **Mexico** 525-6828040, **Netherlands** (10)2620133, (15)609906, **New Zealand** (9)3796882, **Nigeria** (1)967598, **Norway** (2)680650, **Panama** (2)13835, **Papua New Guinea** (675)252555, **Paraguay** (21)490076, **Peru** (14)333410, **Philippines** 2.8125068, **Poland** (26)280627, (58)210818, **Portugal** (1)8519980, **Russia** (95)2054749, (95)4375298, **Singapore** 4792088, **Slovenia** (61)122281, **South Africa** (11)8862200, **Spain** (1)6630100, **Sri Lanka** (1)573692, **Sweden** (8)6260650, **Switzerland** (14)917744, (22)3431150, **Taiwan** (2)7716333, **Thailand** (2)2332261, **Turkey** (1)2746894, **U.K.** 908 262121, **Uruguay** (2)923592, **Venezuela** (2)7624624.

Get Ready For the ATM Revolution

Asynchronous transfer mode has leapt off the drawing boards and into product offerings. Switches and hubs based on the technology will lead the way to a new era of switched internetworks.

New world order? Not when it comes to corporate networks. Sure, the talk may well be all about innovative products and technologies, but the design and implementation strategies are straight out of the workgroup. And it's not just a case of 'if it ain't broke don't fix it': The truth is, internetworks are beginning to buckle and break under the load they're unrealistically now being asked to bear.

The trouble is easy enough to trace. Just consider the chaotic way in which most corporate networks are pieced together. Once users get wind of a new distributed application (and then realise that they can't live another day without it), a technician is sent out to the local wiring closet, some links on the floor-level hub are reconfigured, and the network is segmented yet again with another bridge/router.

At this point, the wiring diagram that indicates which cables run to which panels on the hub has been redrawn more times than the map of the Balkans. And the corporate network is about as stable (response time measured in minutes, crucial data lost in transit, links that crash with each new application).

And things are really just starting to heat up: The exodus from centralised to distributed computing has only just begun. As client-server traffic increases over the next couple of years, it will swamp today's internetworks. The relentless increases in PC processing power and storage show no sign of slowing down, putting desktop performance well ahead of network capacity. Despite a slow start, multimedia (especially video) is on its way. When it hits it could well prove the coup de grace for unprepared internetworks.

When the situation in the political realm reaches the flash point, revolution is imminent. The networking industry is on the brink of its own revolution, one that hopes to unite everything from the desktop to the wide area under the banner of ATM.

As a cell-switching technology, ATM (asynchronous transfer mode) will speed data, voice and video transmissions, replacing the variable-length packets now in use with uniform (53-byte) cells. It also promises any-to-any connectivity and networks that scale easily from a few nodes to global deployment. But ATM alone will not be able to salvage today's over-stressed internetworks. To do that, a new architecture is needed, one that not only integrates ATM into hubs, routers, and switches but also unifies all these elements into what can be described as a switched internetwork.

In essence, switched internetworks build upon the LANs and backbone routers now in place, augmenting familiar internetworks with switching technology (hence the name).

At the departmental level, switched internetworks will consist of ATM-capable smart hubs and routers handling the same jobs they now perform (linking shared LANs to one another and to campus networks). They'll also be used to connect directly to ATM-equipped workstations and implement dedicated LANs to the desktop (see Figure 1 on page 89). The new ATM switches that are now making it to market will be used to connect departmental hubs and routers, and will also form the basis of campus networks.

Expert WAN Analaysis

Let us help you

Experienced technicians know that networks do not function perfectly all the time.

When things go wrong you need tools that are easy to use and perform for you. GN Navtel's 9400 series of Protocol Analysers make the job easier by enabling the operator to quickly identify problem areas within the network.

Australia's biggest network operators are already using our equipment so perhaps it's time to SEE FOR YOURSELF.

Telephone or fax our office to arrange a free loan of one of our instruments.

X.25 SNA DDCMP SS#7 ISDN PRA/BRA FRAME RELAY

GN Elmi

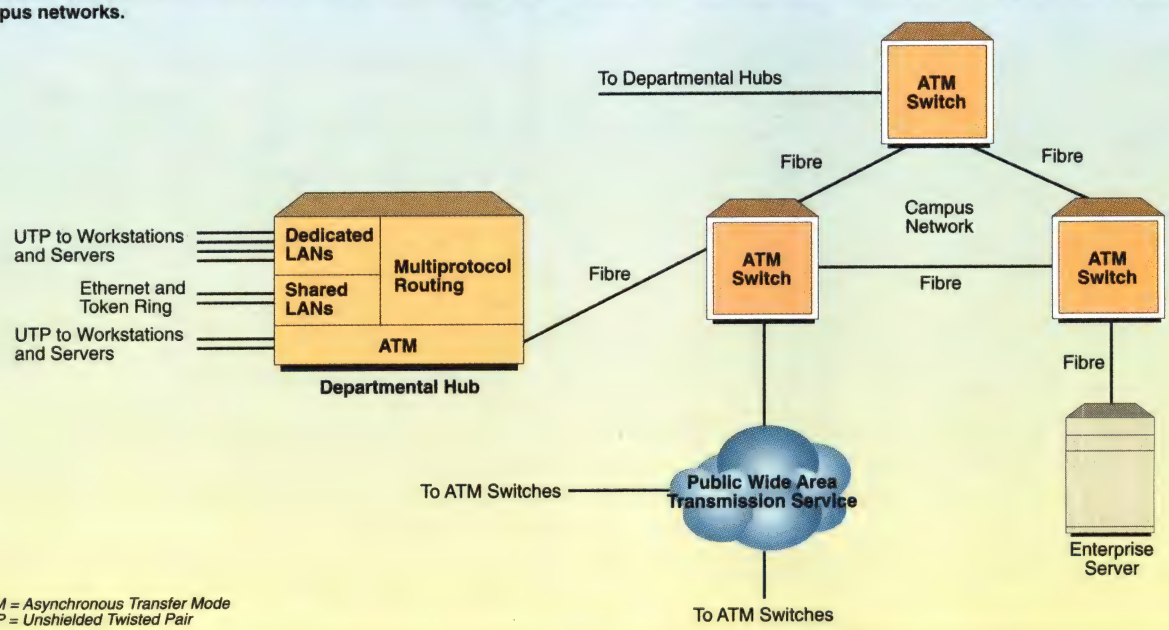
GN Elmi Australia Pty. Ltd.
9, Prospect Street,
Box Hill, VIC 3138
Tel: (03) 890 6677
Fax: (03) 899 5553

Branch office :
Level 6, 90 Mount Street
North Sydney, NSW 2060
Tel: (02) 955 5508
Fax: (02) 955 0401

New Zealand : Leatham
Electronics Ltd.
Wellington
Tel: (4) 385 9409
Fax: (4) 385 7263

Figure 1: Making Sense of Switched Internetworks

Switched internetworks will build upon the LANs and backbone routers now in place. ATM-equipped smart hubs and routers will link shared LANs and established connections to campus networks. New ATM switches will connect departmental hubs and routers and form the basis of campus networks.



Finally, when the carriers introduce their different high speed services, these will be used to link switched internetworks across the wide area.

How quickly will the industry move to switched internetworks? That depends on several factors. At present, ATM is still an emerging technology, and it will take time for standards to be completed and prices to drop to acceptable levels. It's already clear that the first switched internetworks will be implemented at the campus level, where the highest performance is needed and where the simplest ATM standards will suffice.

Beyond that, enhanced versions of conventional technologies also may slow the acceptance of switched internetworks — at least in the short term. New 100Mbps Ethernet products will boost network capacity to some degree (though they represent the last gasp for packet technologies), and the use of switching hubs to microsegment internetworks can accomplish the same end. But these are interim solutions that do not address fundamental problems with today's architectures. Only switched internetworks can do so. And as router, hub, switch and system vendors roll out their various new ATM offerings, switched internetworks will sweep all else aside. *Vive la revolution!*

Client-Server Conundrums

With corporations worldwide looking to run lean and mean for the rest of the decade, it's easy to understand why client-server computing is taking networks by storm. Low-cost PCs and graphical interfaces make workers far more productive than the old text-based terminals and mainframes.

What's more, distributed applications can be developed much faster than their mainframe-based counterparts, with project cycles typically measured in months. That translates into speedier responses to market changes. And as companies grow increasingly decentralised (with employees scattered at various different far-flung sites), the client server model guarantees remote access to applications without the need to resort to dumb terminals.

But there's more to distributed computing than first meets the eye. As network managers implement client-server applications, they're seeing their bandwidth requirements rocket out of sight. Distributed computing makes it possible to consolidate data centres — so two or three megacentres might suffice in lieu of a dozen or more smaller installations. So far, so good: But when widely dispersed users need to access the applications still running on fewer mainframes, networks can quickly run out of bandwidth. Similarly, linking these megacentres calls for plenty of capacity.

It's also important to realise client-server applications have a tendency to foster yet more client-server applications. As applications are moved off the mainframe, the data centre must charge more for those remaining (the cost of maintaining the data centre is fixed but must be shared by a smaller user population). As charges go up, other users redouble their efforts to implement client-server alternatives. At some point, the data centre simply can't cover its operating expenses and it's consolidated with one or more other centres, driving up bandwidth requirements.

Perhaps the most important aspect of distributed computing is the way it's changing network traffic patterns. This isn't simply a question of shifting applications from mainframes to LANs. The essence of client-server computing is that it gives all clients on an internetwork access to any application running on any server — no matter where it may be located.

This is a far cry from conventional LAN applications, in which clients and servers typically share a single local network. For distributed computing to come into its own, every desktop must be able to reach servers on all other LANs, which means that reconfiguration must be handled electronically. (On today's networks, moves, adds, and changes are all done manually). It also means that management will become of paramount importance (or networks will collapse into anarchy).

The PC Push

The need for high-capacity switched internetworks is also being fuelled by rapid increases in PC performance and storage. The processing power of chips coming onto the market is doubling every two years. Today's 486 and RISC-based systems can deliver 50 MIPS (million instructions per second); Intel's Pentium chip, the successor to the 80486, will move system performance beyond the 100 MIPS mark.

RAM and disk capacities are showing similar increases. RAID (redundant array of inexpensive disks) technology is starting to ship in volume. RAID allows disk storage to keep pace with processor improvements by speeding transfers between CPU

and disk by at least a factor of eight (while lowering the cost per byte for multi-gigabyte disks).

Given these advances, it's clear that networks can't remain in the 10Mbps range of Ethernet or Token Ring. And it's not surprising to find workstation and server vendors among the most ardent backers of the new networking technologies, pushing hard to get needed standards in place so they can incorporate ATM into next-generation products. They know their high-performance platforms won't shine if they're connected to today's limited-capacity networks. And they worry (with good reason) that sales of their new systems will suffer if their products overburden customers' networks.

There are other factors to be considered. Multimedia is a wild card in network design at the moment. It's one of the obvious things to do with all the power unleashed by new processors and storage technologies, but it's hard to show any clear business benefits of using multimedia on a widespread basis.

Worse, if multimedia were to suddenly start to take off, the bandwidth requirements of imaging, desktop video, compound documents, and the like would overwhelm today's shared LANs. As very few companies are willing to invest in a separate new multimedia infrastructure, the technology is growing slowly at the moment. But don't be fooled: It's just matter of time before multimedia makes it to the big time. And when it arrives, networks — and network managers — best be ready.

Once again, the answer lies in switched internetworks, which are able to accommodate bandwidth-hungry multimedia applications without being stretched to the breaking point. And once switched internetworks have been built for enterprise-wide client-server computing, a major obstacle to multimedia will be removed.

What's more, the very nature of multimedia favours cell-switching technology. When full-motion video is compressed, it creates a variable-bit rate stream. (If a great deal of motion is present, a large amount of information must be sent over the network; if an image is relatively still, there is far less information). The time-division multiplexing used with packet technologies carves out fixed-capacity channels. When compressed video is squeezed into a fixed channel, there may be more information present than can be accommodated, causing video to be blurry or jerky. Conversely, if relatively little video information is present, most of the channel's dedicated bandwidth is wasted. The statistical multiplexing inherent in ATM does not establish fixed channels and thus is able to handle video much more efficiently.

Overstressed Internetworks

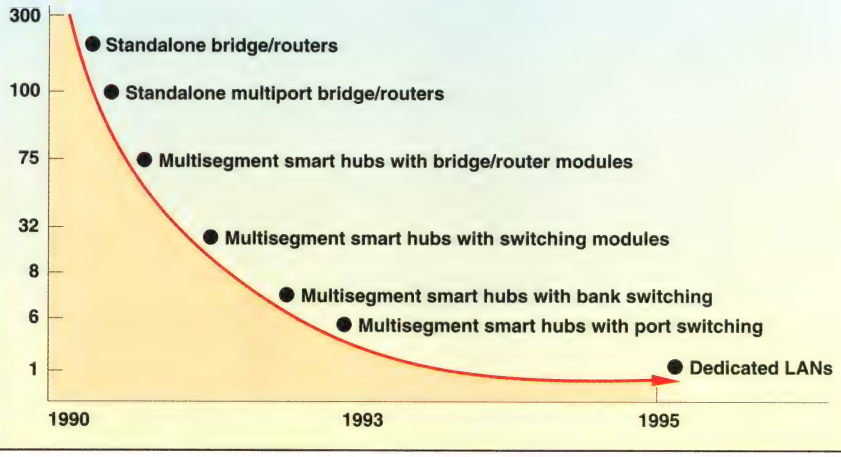
Network managers who are sceptical about switched internetworks should take a hard look at their current configurations. Today's shared LANs are broadcast networks in which all end-stations accept all the frames transmitted, discarding the ones that aren't addressed specifically to them. This characteristic is used by many client-server applications to locate servers or to distribute information. NetWare servers, for instance, regularly announce their presence and services to end-stations using the NetWare Service Advertising Protocol (SAP). Although broadcasts have always been regarded as bandwidth-wasters, NetWare and many other LAN applications were designed to use them. The underlying assumption was that LANs are so fast that capacity would not be a problem. While this was true when local networks were first built, it's hardly the case today. Bandwidth can prove a surprisingly scarce commodity within a single workgroup; once workgroups are joined, it becomes a precious resource.

The conventional technique for dealing with an oversubscribed LAN is to split it in two and connect the segments with a bridge or router. Since bridges and routers filter traffic and only forward frames destined for the other segment, deploying them lessens the load on each segment. The degree to which traffic can be reduced depends chiefly on how well segments can be made to conform to separate user communities.

Over the past few years, corporations with large internetworks have repeatedly segmented them to increase their capacity and improve performance. At this point, though, segmentation is beginning to give way to microsegmentation. Just two or three years ago, as many as 300 users on a campus might have shared a single Ethernet. Today, the typical segment is more likely to link just 20 or 30 end-stations. Within the next two or three years, microsegmentation may assign as few as two users to a single dedicated LAN segment (see Figure 2).

Figure 2: Dedicated LANs: Going One on One

The number of end-stations on LAN segments has dropped dramatically over the past few years. Dedicated LANs will extend this trend, establishing a dedicated segment for each end-station.



To assist users to set up microsegmented LANs, smart hubs, which are the mainstay of today's networks, have been enhanced to accommodate as many as 30 local area network segments. Many hubs allow any module (bridge, router, terminal server, and so on) to reside on any segment.

Some vendors go even further. Bytex and Chipcom sell so-called switching hubs that enable small groups of ports to be assigned to their own segment, a technique sometimes called bank switching. For the ultimate in microsegmentation, some hubs can assign any port to any segment, thus allowing users on different physical segments to be joined on virtual LANs.

Beyond the Backbone

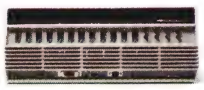
On most internetworks, smart hubs at the floor level are connected using fibre optic cable. Many large organisations have also been installing fibre throughout their buildings and campuses in anticipation of the need for high speed backbones.

In general, links between buildings and campuses use either a collapsed backbone or a distributed backbone. With a collapsed backbone, each hub is connected via a LAN to a central multiport bridge or router (see Figure 3 on page 92). The hub ties together the departmental LANs. If it supports only one segment, then that segment is extended to the router. The router's internal bus serves as the backbone network.

Collapsed backbones are popular because they allow common technologies, like Ethernet, to link hubs. They also deliver excellent performance, since the buses in high-end routers are extremely fast. The backbone router also establishes a readily available interface to the wide area.

SynOptics smoothly integrates new technologies into your existing network.

An enterprise network is one of your business' strategic assets. And with the constant arrival of new network technologies, you need a partner that will help you merge and manage both the old and the new. That partner is SynOptics.



SynOptics' new LattisCell™ product family enables you to build a complete ATM network, from corporate backbones to desktop connections.

Through the years, we've helped smooth the transition to new capabilities. Now SynOptics takes you one step further, with the creation of a cohesive network fabric—an underlying structure that connects and manages individual technologies through the intelligent hub. It provides high-speed network communications. And it's flexible enough to grow as your network does, without sacrificing your existing investment.

When you demand Asynchronous Transfer Mode (ATM) technology, we've got it. LattisCell,™ SynOptics' second-generation ATM solution, greatly increases performance both on the backbone and on the desktop. Plus, it's integrated into a powerful silicon chip set, offering you a significant cost advantage.

In addition, SynOptics' Optivity™ network management software gives you the visibility to control connectivity, bridging and routing functions from a single management station, or diagnose problems that encompass the entire network fabric.

So if you're building or managing an enterprise network, get the wrinkles out with our integrated solutions. To learn more about SynOptics' ATM solutions, call Australia 008 81 7070 or New Zealand 0800 44 7070. Because at SynOptics, we're smoothing the way for the network of the future.

SynOptics

The Network Fabric of Computing

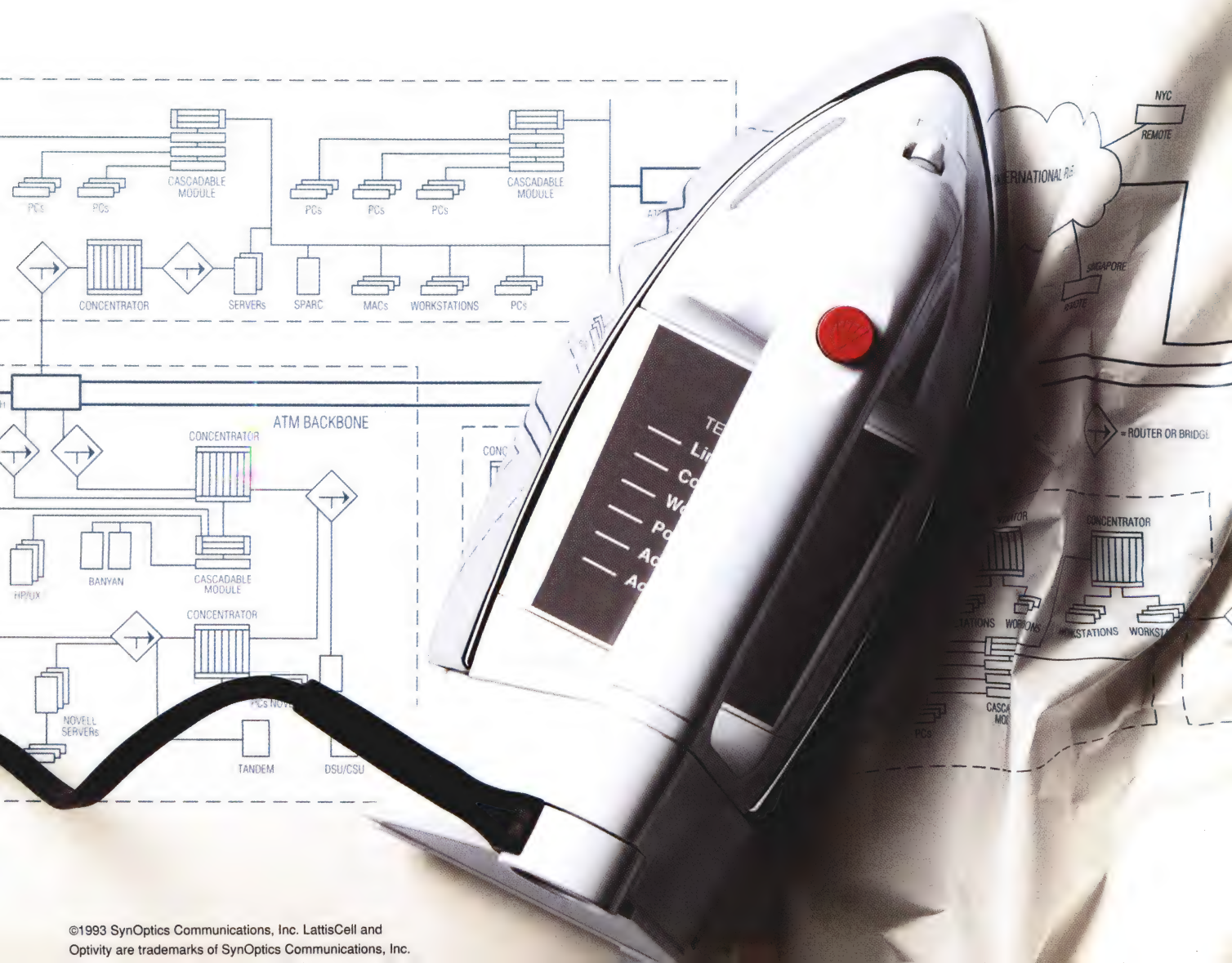
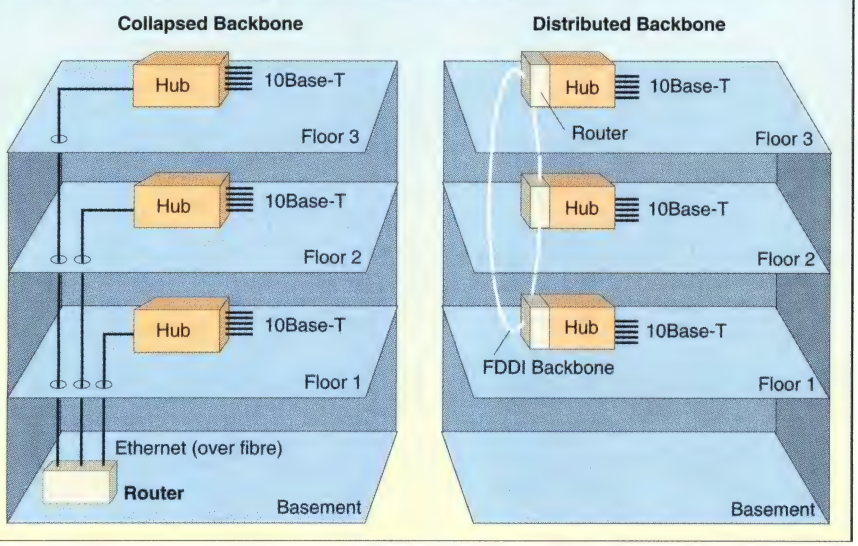


Figure 3: Building Backbones

Collapsed backbones use LANs to link hubs to a central multiport bridge or router. The hub ties together the departmental LAN. Distributed backbones use high speed LANs to connect hubs, distributing the routing function thoughout the network.



With a distributred backbone, the hubs are linked via a fast LAN such as FDDI. Bridges or routers are typically used to connect the departmental LANs linked to the hubs. The topology gets its name from the fact that routing functions are distributed throughout the network.

But neither a collapsed nor a distributed backbone can meet the growing needs of client-server applications, adequately support faster PCs, or serve organisations that require highly manageable, readily reconfigured networks.

The first problem has to do with microsegmentation, a staple of both approaches. Microsegmentation can only work if clients and servers that need to communicate frequently are on the same segment. But on corporate networks, where users are located has little to do with what they are working on or who they are working with. And even if it were possible to group users together, once a project is complete they move on to other assignments, and must be assigned to different segments.

Microsegmentation also can be costly. As the number of segments increases, more bridges and routers are needed. Routers also can prove to be an administrative headache, since resegmenting the LAN means changing all the addresses of the end-stations on the new segment.

The collapsed backbone is also hindered by deficiencies in today's routers. Routers are packet switches, essentially based on the same approach used in X.25 packet networks. Although their internal buses are fast, they don't offer adequate capacity to support all connected LANs. Further, their software-based switching logic introduces delay into a session, since an entire packet must be read in before it can be shipped out.

It's true that faster LANs can be introduced into both collapsed and distributed backbones to boost bandwidth. But when faster LANs are used to speed up desktop links, every end-station must be equipped with a new network interface adaptor. Cost then becomes an issue.

When it comes down to it, though, even FDDI isn't fast enough for distributed backbones at today's traffic levels. Capacity can be increased through segmentation, but the cost of FDDI hardware makes this painfully expensive. Besides, segmentation (in effect) simply transforms a distributed backbone into a collapsed backbone, with all its attendant problems. And there's no guarantee that the backbone will not have to be segmented yet again.

The bottom line is that microsegmentation and faster shared LANs are short-term solutions. They don't enable collapsed or distributed backbones to adequately meet the needs of corporations that rely heavily on client-server computing. Today's LAN internetworks, based on shared LANs and routers, are thus reaching the end of their lifespan. What's needed is a new approach to building and campus backbones.

The Quiet Revolution

For all their revolutionary import, switched internetworks are actually an extension of the same model that designers of enterprise networks have been following for the past few years. Smart hubs will remain the key departmental element of switched internetworks, establishing interfaces to Ethernet, Token Ring, and FDDI LANs. They will also make the link to the desktop — as soon as ATM adaptors become available for PCs and other end-stations. These smart hubs may be new ATM boxes, upgraded equipment with ATM modules, or (most likely) a mix of both.

ATM switches will be used to build the actual building and campus networks and link hubs using high-speed (155Mbps and above) fibre optic links. Central servers will also be tied directly to the ATM switches via ATM interfaces.

Finally, when high-speed carrier services are rolled out, they'll extend switched internetworks over the wide area. Most likely, such offerings will use ATM protocols internally, making it relatively simple to join campus networks and WANs.

In essence, a switched internetwork is an updated collapsed backbone — albeit one with new protocols (ATM) and higher-performance components (ATM switches instead of routers). At the same time, the switched architecture does borrow from the distributed backbone, since the packet-routing function is distributed out to the smart hubs used to link shared LANs to the ATM backbone.

Switched internetworks have the potential to achieve one of the most elusive goals of networking — universal interoperability. ATM is the only cell-switching technology being considered by vendors. ATM standards are primarily being formulated by the ATM forum, a consortium of carriers, vendors of network equipment, and computer manufacturers. Although based in the United States, its standards are endorsed by the CCITT (International Telegraph and Telephone Consultative Committee).

Switching Gears

At first, ATM switches will be used in corporate networks to connect existing Ethernet and Token Ring (displacing FDDI into the bargain) to join T1/E1 or T3/E3 links. They'll tie these networks together in much the same way as multiprotocol routers, using ATM interfaces that hub and router vendors are starting to introduce. Although this configuration is not a true switched internetwork (it does not deliver dedicated bandwidth end-to-end), it is an important first step.

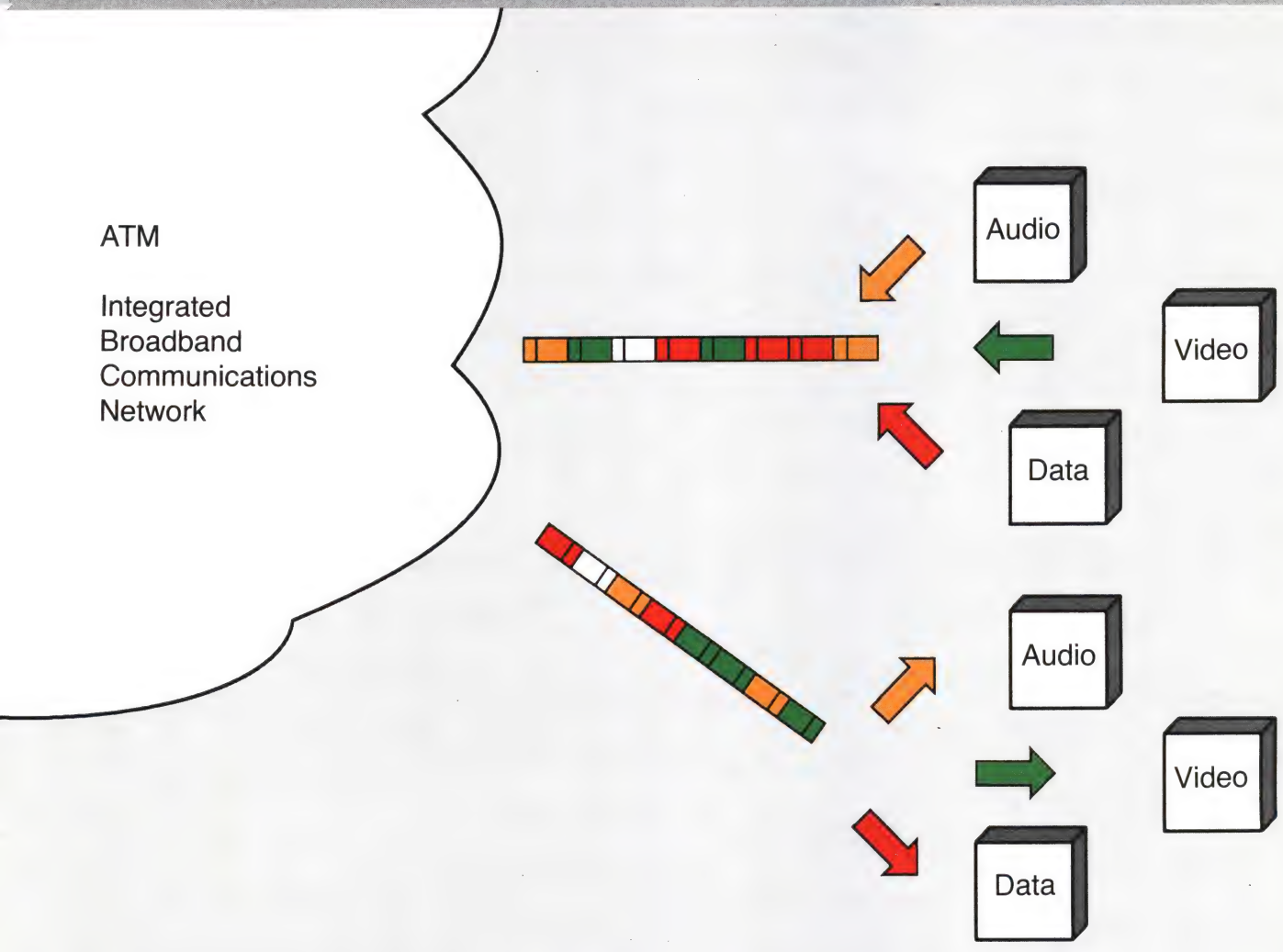
Over a dozen vendors are in the process of bringing ATM switches to market, and other vendors seem to issue statements of direction every week. The aggregate bandwidth of these switches runs in the 2 to 10Gbps range, although many can be scaled to deliver far more throughput. Aggregate bandwidth indicates the total capacity of all the ports communicating through a switch; an ATM switch with 10 155Mbps ports, for example, delivers an aggregate bandwidth of 1.55Gbps (see Figure 4 on page 94).

Switch architectures vary according to the vendor, and it's still too early to pick clear winners or losers. All the new ATM products use hardware-based cell switching, which means cells are actually switched within a chip or group of chips (usually

Are you prepared?

ATM

Integrated
Broadband
Communications
Network



User demands on digital networks are expanding at an unprecedented pace for services such as data, speech, text, video conferencing and high resolution TV. This requires a single integrated multi-purpose network with transmission rates exceeding 100 Mbit/s.

CCITT set recommendations for the solution – ATM (Asynchronous Transfer Mode).

The European Community set up a major telecommunications Research and Development programme into ATM (RACE). Wandel & Goltermann was selected as the project leader for test and evaluation equipment (PARASOL). This close relationship with Telecommunications Carriers, System Manufacturers and Standards Organisations such as CCITT and ETSI has assured that Wandel & Goltermann is at the forefront of this technology.

Participate and profit from our leadership in this new and exciting development, call us today and discuss your ATM measurements and evaluation solutions:

Wandel & Goltermann Pty Ltd
PO Box 419
World Trade Centre
MELBOURNE VIC 3005
Phone: (03) 6 90 67 00, Fax: (03) 6 90 67 50

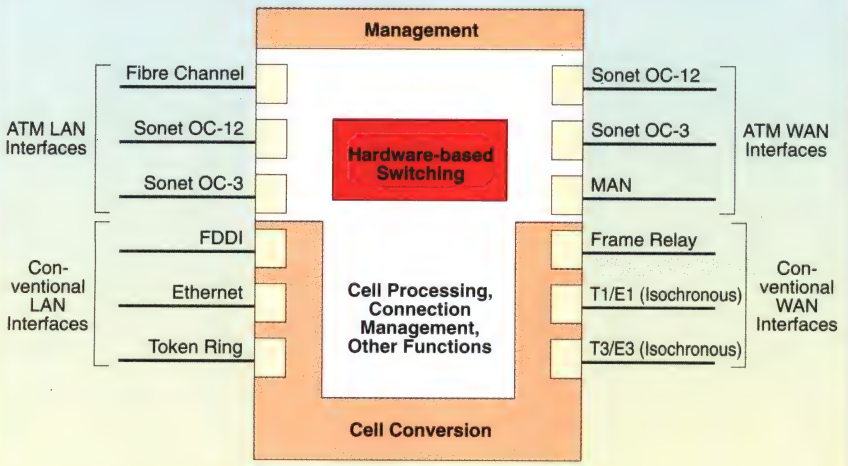
E1.93/AUS/89/4C

Wandel & Goltermann

Electronic Measurement Technology

Figure 4: Anatomy of an ATM Switch

ATM switches will be loaded with interfaces to the local and wide areas and will accept packets from conventional LANs and WANs, converting them into the cells used for ATM transmissions. Hardware-based switching at the chip level will make these boxes blazingly fast.



Sonet = Synchronous Optical Network

ASICs [for Application-Specific Integrated Circuits] or large gate arrays). Routers, in contrast, forward packets using software to move data in and out of memory. Switching at the chip level is far faster.

ATM switches also support multicast transmission, which enables them to receive a stream of cells and then simultaneously retransmit the same data out of multiple ports. Multicast is a key requirement for videoconferencing among multiple participants. It also makes it possible to send data to a specified group of ports on a ATM switch. This allows broadcast messages regularly issued by NetWare, for instance, to be received only by those users who need to receive them. The ability to define so-called broadcast domains is one of the most important attributes of a switched internetwork. It enables users to be assigned to any workgroup, without regard for their actual location, in what is sometimes referred to as a 'virtual LAN.'

Smarter Hubs

Once the smart hubs and routers already deployed on networks are equipped with ATM interfaces, they can be integrated into a switched internetwork. But upgrading existing products is only the beginning. A new generation of smart hubs also is in the offing. These will offer much greater capacity and will be pressed into service at sites with many LAN segments. It's important to realise that the hub backplane has become a backbone of its own, and that backbone needs to be expanded.

The coming generation of smart hubs will feature new hardware to furnish the high speeds that switched internetworks call for. For example, to drive an OC-3 (155Mbps) ATM link from a hub to an ATM switch at full speed (an aggregate bandwidth of 310Mbps, since ATM links are full duplex), about 75,000 packets would have to be switched each second (assuming 500-byte packets). All the hub-to-switch interfaces defined by the ATM Forum will support similar speeds and require similar processing power. These new interfaces include the User-to-Network Interface (UNI) over T3 (45Mbps), UNI over FDDI (100Mbps); UNI over fibre channel (155Mbps); and UNI over Sonet (Synchronous Optical Network) at OC-3 (155Mbps) speeds. Like the ATM switch vendors, many hub vendors are resorting to hardware-based switching to support these transmission speeds.

Most likely, these new hubs will be built along one of two schemes. Some will feature a very high-speed bus (implemented with conventional technologies) that is shared by all port cards. A plug-in ATM interface module will establish the connections between the backplane bus and the ATM network. Other hubs will feature ATM transmission on each port card, with dedicated connections between each card and the ATM switching module.

Of the two approaches, the latter may be the better long-term solution. It will almost definitely prove less expensive than the shared-bus scheme. If a bus is shared, it's going to have to run extremely fast in order to supply each card with adequate bandwidth to the ATM switching module. And very expensive electronic components will be needed on each card to connect to such a high speed bus.

In addition to major increases in backplane capacity, these new hubs will make it possible to implement dedicated, or desktop, LANs. In this approach, each end-station is linked to a hub via its own private local network; in other words, the LAN plugs into a port on a hub. Ethernet and Token Ring are used to establish point-to-point connections between the hub and the end-station.

A dedicated LAN is built by installing a multiport bridge or router module in a hub and dedicating each port on the module to a single station (hence the name). As long as the bridge or router is fast enough to forward packets at wire speed, each end-station will have access to the full bandwidth of the dedicated LAN.

The beauty of a dedicated LANs is that it increases capacity without requiring new network interface adaptors at the desktop. A dedicated Ethernet should be fast enough to allow full-motion video, client-server applications, imaging, and colour printing to be handled on a switched internetwork.

Dedicated LANs greatly reduce the need for ATM to the desktop, although there will be some instances in which more bandwidth is needed than a dedicated LAN can deliver. If the price of ATM interfaces for personal computers drops low enough, they may be an attractive alternative to corporations installing new workstations.

Routing Remains

It's very important to understand that even though ATM switches will ultimately replace the routers used to implement collapsed backbones, that doesn't mean there's no room for routing on a switched internetwork. Rather than being eliminated, routers will be integrated into modules for smart hubs and used to connect Ethernet and Token Ring LANs with one another and with ATM switches.

When (and if) ATM is implemented on end-stations, and networks are based on end-to-end cell switching, there will be no more need for conventional routing. This is not likely to happen soon, and until it does, routing modules in the smart hub will be the point at which frames are transformed into cells. The routing used in smart hubs will be far less complex than today's hardware, which deals with a wide range of protocols.

Despite the promise of switched networks, there's still a long way to go (and a lot of problems to be solved) before they'll come into their own. For one thing, the kind of bandwidth they call for is prohibitively expensive over the wide area. It's one thing to champion 155Mbps links over campus fibre installed and owned by a corporation; it's another to talk coast-to-coast ATM.

The situation is likely to change in the future. Carriers are beginning to invest in ATM switches and Sonet transmission gear to deliver the capacity needed to move switched internetworks beyond the campus. As competitive services arrive from alternative carriers,the mainstream providers will real-

OpenGate™ is king of all networks.

Modular Multiprotocol Router

In today's multimedia enterprise-wide network you need OpenGate™. The only multiprotocoal router that delivers parallel RISC technology and total fault tolerance. There's an OpenGate™ platform that's right for you, from a small office router to a 12 slot multiport backbone router. You get redundancy and hot-swapping for all critical hardware, as well as field proven traffic control features that improve network operation. With OpenGate™, it is clear why RND continues to be one of the world's leading pioneers in internetworking.

To find out more about OpenGate™ call RND today. You'll be surprised how affordable is the king of all networks.

OpenGate™

RND For Networks With Ambition

RAD Network Devices

Western Region
7711 Center Avenue, Suite 270
Huntington Beach, CA 92647
Tel: (714) 891-1446
Fax: (714) 891-1764

Eastern Region
151 West Passaic Street,
Rochelle Park, NJ 07662
Tel: (201) 587-0404
Fax: (201) 587-0334

TOREN Member of the Ipex Group

TOREN Computer Communications Pty,Ltd.
(Member of the Ipex Group)

Melbourne
Tel: (03) 242 5050
Fax: (03) 242 5055
Sydney
Tel: (02) 319 2755
Fax: (02) 699 2093
A.C.T
Tel: (06) 253 2665
Fax: (06) 253 2669

Dataplex

Dataplex Pty, Ltd.

Melbourne
Tel: (03) 210 3333
Fax: (03) 210 3399
Sydney
Tel: (02) 349 3911
Fax: (02) 349 7747
A.C.T
Tel: (06) 285 3657
Fax: (06) 285 3696

A Little Goes A Long Way.

AT-210T *$104*. AT-MX10 *$116*. AT-MX25F *$540*. AT-MX26F *$540*

Little transceivers. Little money.

Allied Telesis' micro transceivers are so small and lightweight that they can be connected directly to AUI ports on computers or workstations. BNC, UTP or Fibre Optic cable directly to the users, simplifying your wiring and eliminating costly, cumbersome AUI cables.

Our micro transceivers save you money, by eliminating costly drop cables and by being, quite simply, the most cost-effective transceivers in the industry.

Long on quality. Long on options.

Each ATI transceiver carries a two-year warranty. In addition, because we only manufacture to the IEEE 802.3 specifications, we can guarantee high performance and interoperability with all industry standard equipment.

We make the micro transceiver to fit your needs: choices include 10BASE2, 10BASE-T and the smallest FOIRL transceiver available today.

When your network calls for transceivers, **call us on (02) 980 6922.**

Allied Telesis Excellence in Connectivity

A DIVISION OF
Metal Manufactures Limited
Level 7, City View Office Estate
423 Pennant Hills Road, Pennant Hills, NSW 2120

DATA NETWORKS

PRICES QUOTED ARE RRP EX-TAX, AND ARE CORRECT AT TIME OF PRINTING.

E&T/MMDA 2227

ise that it's in their best interests to deliver high-speed public interconnect services in a timely fashion.

The big question is how these new services are to be priced. If carriers make high-capacity ATM links available, users will almost certainly multiplex all their traffic onto them, eliminating a good part of their WAN traffic. On the other hand, if carriers are going to participate in the lucrative switched market, they've got to deliver capacity at reasonable prices. There's no easy answer to this dilemma.

As well, standard procedures for handling congestion and flow control have yet to be defined for ATM. While it's true that the degree to which either will be needed depends upon switch architecture and efficiency, the actual performance of a switched internetwork ultimately depends upon switches being able to notify senders that congestion is present and they should throttle back. The ATM Forum is studying the issue now.

Price is another problem. In order for cell switches and smart hubs to catch on, they're going to have to be affordable. Right now, expensive ATM chips are available from a variety of vendors. One or two vendors must gain control of a sizable piece of the market if silicon prices are going to come down. It's anyone's guess as to how long it will take for the market to shake out.

If prices remain high, enhancements to existing technology, such as newly proposed 100Mbps Ethernet, may become more attractive than ATM. And of course, more than one 100Mbps Ethernet scheme has been proposed, so by the time a standard is agreed upon, the cost of ATM equipment may have come down significantly. Bank-switching hubs (which assign a group of ports to a single LAN segment) and dedicated LANs may become popular alternatives to extending ATM to end-stations.

It's also possible that ongoing efforts to conserve bandwidth may move ahead faster than the need for switched internetworks. Compression technologies may keep traffic in the range where T1/E1 and shared LANs are sufficient. Better designs for the client-server applications coming on-line may also keep the load on networks from building up as quickly as it has in the past. But in truth, efficient design yields only a small increase in capacity, and developers rarely pay much attention to it.

Ready to Switch

Network managers anticipating a move to switched internetworks best begin planning now, and a few simple guidelines could prove very helpful. For one thing, go with star topologies at both the floor and departmental levels, regardless of whether a collapsed or distributed backbone is to be implemented. This will ensure that fibre and wiring-closet equipment will be in position to support the switched internetwork, which also uses a star topology. It's also important to make sure that fibre is always used at the building and campus levels.

Also keep in mind that with either a distributed or collapsed backbone, routing will eventually be integrated into departmental hubs. This makes it critical to support an open routing algorithm, like OSPF (open shortest path first), since equipment from many different vendors will likely be used.

If client-server computing, high-powered workstations, or multimedia applications are in the plans, don't rush to buy higher-speed shared LANs. The dedicated LAN looks to win easily; it offers the path of least resistance to higher bandwidth and leaves network adaptors and software intact.

It's also important to realise once the choice is made for dedicated LANs, there's no reason to buy new Token Ring adaptors. Token Ring LANs cost at least 50% more than Ethernet and offer no advantage in a dedicated configuration (IBM compatibility ceases to be an issue when each end-station has its own dedicated segment). In addition, a dedicated Token Ring LAN will be more expensive to implement because the protocol is much more complicated than Ethernet.

Also keep in mind that for corporations with one or more large campuses or a very large building, an ATM switch is likely to be the only backbone that can deliver the needed capacity. FDDI and other LAN technologies are not going to be anywhere near fast enough. Users should avoid serious investments in FDDI. If cell relay doesn't do in FDDI, 100Mbps Ethernet will.

Finally, implement LANs using modular smart hubs; these establish a clear path to the new switched technologies. Be certain to specify high-capacity backplanes for any new hubs purchased. And expect to spend liberally: Backbone switches will account for only about 20%of the overall costs for switched internetwork hardware.

The Vendor Angle

It's easy to understand why so many vendors across the industry are eager to build equipment for use in switched internetworks. Hub and router vendors see ATM gear as a way to maintain their astronomical growth. Multiplexer and system vendors see the emerging market for switched internetworks as a chance to re-establish their once thriving businesses.

Because so much is at stake, suppliers aren't merely racing to get products out the door, they're working overtime to publicise their efforts. Vendors that haven't already shipped ATM products have announced them, issued statements of direction, or want to talk about their plans.

As discussed, switched internetworks will encompass hubs with ATM capabilities and ATM switches. An initial examination of vendors' product plans shows that the same basic designs and platforms are likely to serve as the underpinnings for both types of products. An initial look at product plans shows that vendors regard partnerships as the best means to bring products to market.

Almost every vendor surveyed said it had development agreements with other suppliers, though not every vendor would name names (see table on page 98). Fore Systems, which makes a small ATM switch, and MPR Teltec (now owned by Newbridge Networks), which also manufactures an ATM switch, have already cut deals with Cabletron Systems and Newbridge. Both Fore and MPR are likely partners for other vendors too. They may lack the marketing muscle to make it on their own but will find a waiting market for their technology.

Hub Vendors

Typically, a well-engineered corporate network will spend 75% to 80% of its equipment budget on smart hubs, with the rest going to backbone switches and routers. It's easy to see, then, why so many vendors are eager to crack the smart hub market.

Many hub vendors are following similar product development strategies: Almost all are making the ability to support dedicated LANs a number one priority, with some suppliers OEMing products to deliver dedicated LANs. SynOptics Communications sells a version of the Etherswitch from Kalpana as an add-in module for its LattisNet hubs. It also just introduced a standalone ATM switch, called LattisCell. Both Kalpana and Alantec, which sells a switch that supports dedicated Ethernet LANs, are likely partners for other hub vendors.

Kalpana and Alantec are hardly alone in their support for Ethernet, which is the type of LAN most dedicated networks will accommodate. Cabletron recently announced plans for 20Mbps Ethernet; and many other vendors are saying they intend to support 100Mbps Ethernet. Dedicated Token Ring is likely to come much later, if at all, because its inherent complexities make it difficult to develop a Token Ring switch.

The strategies hub vendors have come up with to deliver ATM are strikingly similar. Most plan to introduce their first ATM features — as upgrades to existing hubs or as new products — within the coming year.

First out of the gate will be ATM switching modules for hubs, which will make it possible to connect a hub and all linked LANs to an ATM switch. The ATM Forum's UNI over Sonet is the preferred interface, although some will also accommodate UNI over T3. By implementing standard interfaces, vendors can help make sure that their hubs are compatible with a wide range of switches.

Over the next two years, some vendors will add an ATM backplane to their hubs. In this approach, each port card communicates

ATM: What's Ahead for Smart Hubs

VENDOR	ATM UPGRADE OR NEW HUB	SUPPORTS DEDICATED LAN	INTERFACE TO ATM CAMPUS NETWORK	INTERFACE TO ATM NETWORK ADAPTORS	ATM BACKPLANE	ATM INTERFACES	ATM SWITCH PLANNED
Adaptive Corporation +1-415-366-9500	ATMX hub already shipping	Yes	Yes	Yes	Yes	UNI over Sonet, T3	Can act as hub or switch
Artel Communications +1-508-562-2100	Upgrade to Galaticomm Switching Hub	Yes	Yes	Not announced	Not announced	UNI over Sonet	Yes
Bytex JNA (02) 417 6177	Upgrade to Series 7700	Yes	Yes	Yes	No	UNI over FDDI	No
Cabletron Systems (02) 878 5777	Upgrade to MMAC hub; new hub planned	Not announced	Yes, both hubs	New hub	New hub	UNI over FDDI, Sonet	Yes
Cameo +1-603-888-8869	Upgrade to Ultrahub 5000	Not announced	Yes	Not announced	Yes	UNI over T3	Yes
Chipcom (02) 416 0653	Upgrade to Online	Yes	Yes	Yes	No	UNI over FDDI	No
Cnet Technologies Computer Protocol (09) 311 7111	Upgrade to 9000	Yes, both hubs	Yes, both hubs	Yes, both hubs	Yes, both hubs	UNI over Sonet	Yes
DEC (02) 561 5252	Upgrade to DEChub No. 900	Yes	Yes	Yes	Yes	UNI over Sonet	Yes
Fibermux MM Data Networks (02) 980 6922	Upgrade to Crossbow	Yes	Yes	Yes	Yes	UNI over fibre channel, Sonet, T3	Yes
Fibronics Toren (03) 242 5050	New hub planned	Yes	Yes	Yes	Yes	To be announced	Yes
Hughes LAN Systems +1-301-428-5500	Upgrade to ATM backbone hub	Yes	Yes	Yes	Yes	UNI over fibre channel, Sonet	Yes
Lannet Toren (03) 242 5050	Upgrade to LET-36 and LET-10	Yes	Yes	Yes	No	Not announced	Yes
Optical Data Systems Netland (02) 622 8505	Upgrade to ODS Infinity	Yes	Yes	Yes	Yes	UNI over FDDI, fibre channel, Sonet, T3	Yes
Plexcom ADE (03) 543 2677	Upgrade to Plexnet SX Multinetwork hub	Yes	Yes	Yes	Yes	UNI over FDDI, fibre channel, T3	Hub will integrate switching
Raycom Systems ADE (03) 543 2677	Upgrade to Fiberring 100	Yes	Yes	Yes	Yes	UNI over T3	No
Synernetics +1-508-670-9009	Upgrade to LANplex 5000	Yes	Yes	No	No	UNI over Sonet	No
SynOptics (02) 853 0799	Upgrade to LattisNet	Yes	Yes	Yes	Yes	UNI over Sonet	Yes
3Com Corporation (02) 959 3020	Upgrade to Linkbuilder	Yes	Yes	Yes	No	Not announced	Yes
Ungermann-Bass (03) 578 0814	Upgrade to Access/One; new hub planned	Yes, both hubs	New hub	New hub	New hub	Not announced	Yes
Xyplex NetArch (07) 393 1933	Upgrade to Network 9000	Yes	Yes	Not announced	Not announced	Not announced	No

Sonet = Synchronous Optical Network
UNI = User-to-Network Interface (specified by the ATM Forum)
T3 = US 45Mbps transmission standard
FDDI = Fibre Distributed Data Interface

with an ATM switching module using ARTM, which gives very high throughput. (Some vendors dispute the use of the term 'backplane' to describe this architecture, arguing that the word only applies to the shared communications path featured in conventional hubs).

Some vendors indicate that they won't go with an ATM backplane or will wait until standards are further along. For instance, Lannet Data Communications' LET series uses a high speed shared backplane; according to the vendor, when it is paired with an ATM switching module, it offers performance equivalent to an ATM backplane.

An interface to ATM network adaptors is also a consideration for most hub vendors, although timetables are not yet in place. The general plan seems to be to track the market and offer interfaces as demand grows. Servers are likely to be the first type of networking gear equipped with ATM adaptors and connected directly to hubs. Some hub vendors also say they'll introduce ATM switches. These are likely to be based on the same technologies and designs as their hubs, although details are scant.

A few vendors have not yet announced ATM plans or have relatively unaggressive delivery schedules. Some, like Proteon, simply don't want to give out details before officially announcing products. Others, especially makers of switching hubs such as Bytex and Chipcom, say that ATM standards are not yet mature enough to implement and believe that today's technologies will suffice over the next few years. This could prove to be very short-sighted, given the importance of ATM and the cut throat competition in this business.

Router Vendors

A year ago, many router vendors downplayed the significance of ATM. The idea that ATM switches would eventually replace backbone routers was understandably unappealing. They've now changed their tune. Perhaps they were stung by user criticism of routers in large networks. Still, while router vendors recognise the basic need for routers to coexist with ATM networks, they're not fully supporting this new architecture. Router market leaders Cisco and Wellfleet view ATM as yet another technology that must be integrated into the corporate network rather than as the fundamental technology upon which the corporate network is based.

Both companies are taking similar approaches to ATM. Both have signed deals with vendors of CSU/DSUs (channel/data service units) to bring an ATM DSU to market. DSUs converts packets into cells, thus making it possible to link a router to an ATM switch. Both Cisco and Wellfleet promise shipment in the middle of 1993.

Cisco also plans to add this technology directly to its router, as an ATM interface. This will let PCs equipped with ATM network adaptors be directly attached to Cisco routers. The new card will be available early in 1994.

Wellfleet says it's looking at switching technologies that will let its Backbone Link Node and Backbone Concentrator Node routers to concurrently carry ATM and conventional protocols. No delivery schedule has been announced.

Router vendors are involved in a lot of partnership activity. On the one hand, deals with suppliers of WAN equipment and multiplexer makers represent a source of revenue. On the other, partnerships will help vendors of ATM switches better compete against router vendors. Adaptive is working with Retix; Cisco, with SynOptics; Newbridge, with Advanced Computer Communications; and Wellfleet, with Fibermux.

WAN and Multiplexer Vendors

While WAN and mux vendors do a lucrative business, growth over the past few years pales when compared with the smart hub market. Both groups are well aware of having missed out on the internetworking market and see switched internetworks as a golden opportunity.

They may well be right: With ATM, congestion control and optimised traffic flow becomes very important. WAN and mux vendors have considerable experience in such matters, and they believe it will be easier for them to add LAN expertise than for hub and router vendors to gain a comprehensive understanding of the wide area.

US-based Adaptive, a subsidiary of Network Equipment Technologies, is looking to take a leadership role in the ATM world. It was one of the first to introduce at ATM LAN hub, the ATMX, a departure from NET's usual activities in the campus and wide area. ATMX supports virtual LANs and has extremely high capacity. It delivers ATM interfaces to end-stations, but the company also has announced plans to supply other interfaces.

Newbridge Networks stands in sharp contrast with Adaptive. So far, it says it will sell products for campuses and WANs, its traditional areas. The Newbridge 361X0 Mainstreet ATM Switch will be the company's primary offering for switched internetworks. The 361X0 is the product of a joint development agreement with MPR. It's extremely scalable, offering an aggregate capacity ranging from 622Mbps up to 10Gbps.

Ascom Timeplex intends to continue refining the capabilities of Synchrony, its current broadband switch. Synchrony is a scalable unit (155Mbps to 2.4Gbps) that can be deployed on time-division multiplexer, frame relay, and ATM networks.

Stratacom has used call switching in its IPX switch since 1986. It will supply an ATM interface for the IPX that can convert its native 24-byte cells into the 53-byte cells used by ATM. The IPX will then support connections to ATM networks but will be positioned as a building block for narrowband private WANs rather than switched internetworks. The ATM interface will be available in the fourth quarter of 1993.

Stratacom also recently introduced the Broadband IPCX (BPX). The BPX is similar to the IPX but uses ATM internally. It is an extremely scalable device, offering aggregate throughput to 9.6Gbps. It is meant to serve as a building block for campus and wide-area networks.

BBN Communications and GTE Government Systems are two other noteworthy players. BBN, a leader in US Government X.25 networks, missed the boom in routers and has been particularly active in developing an ATM strategy. Its partnership with Ungermann-Bass combines UB's installed base and hub technology with BBN's WAN experience, a potentially potent pairing.

GTE is making its initial foray into the commercial market with ATM products. Its Spannet is an ATM-based switching node which can be configured for high-performance workgroups or as a centralised building/campus/WAN ATM switch. Spannet is already shipping.

Systems Vendors

The big systems vendors like IBM, AT&T, Digital Equipment Corporation, Hewlett-Packard, NCR, and Sun lost the enterprise to the router and hub vendors, and they want it back. They recognise the need to foster high-performance networking if they want to sell high-performance computing.

DEC is building its own high-end hub, the DEC-hub 900. It will support ATM and dedicated LANs. No shipping date has been announced. If DEC applies the same modular design to the 900 as it did to the DEChub 90, it could have a winner.

IBM is reselling Chipcom hubs, and has announced its intention to fully support ATM in its Blueprint, but product details are scarce. Among other systems vendors, only AT&T has announced plans to provide a smart hub for the switched internet.

Sun and Hewlett-Packard have yet to announce ATM products but are strong proponents of ATM as the basis for higher-performance networks. Both are influential in the ATM Forum. Sun argues that technologies such as dedicated LANs and ATM offer the opportunity to build a single stable platform across the wide area, while Hewlett-Packard looks to switched internetworks as the foundation for more bandwidth-intensive applications.

James Herman is Vice President of Boston-based Northeast Consulting Resources, a firm which specialises in advanced architectures for distributed computing. Christopher Serjak is a consultant with the firm.

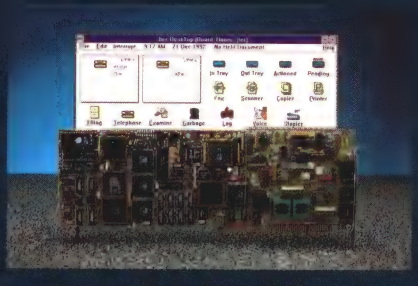
Jtec

Solutions

Networking Multiplexers
for
Voice
Data
Video *and*
ISDN Applications

A complete family including support for smaller sites

Data only applications supported by Advanced ISDN Terminal Adaptors



Intelligent PC Add In cards for Advanced DeskTop Applications

Comprehensive yet affordable Network Management

Head Office
Jtec Pty Limited
ACN 003 169 088
Unit 3
118 - 122 Bowden St
Meadowbank 2114
NSW Australia

Phone

International	612-809-6933
Sydney	02-809-6933
Melbourne	03-263-0200
Brisbane	07-229-9137
Canberra	06-256-3480
Europe	35-321-277-422

Fax

International	612-809-6619
Sydney	02-809-6619
Melbourne	03-263-0215
Brisbane	07-221-6625
Canberra	06-201-3003
Europe	35-321-270-420

Taking a Practical Look at ISDN

There has been plenty of textbook discussion on what ISDN is and how it may be used. But what about ISDN's problems? Greg Smith takes a look at the practical issues faced by ISDN users.

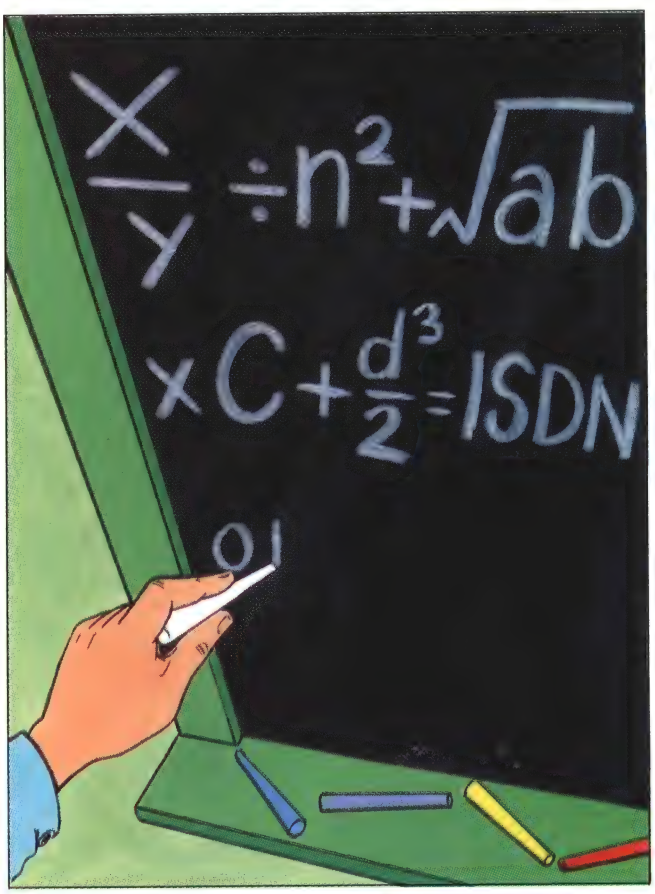
It is important when discussing ISDN and some of the difficulties experienced by its users to ensure a very clear picture exists as to what it is and how it relates to other network offerings provided by the carriers. First and foremost, it must be stressed that ISDN, the Integrated Services Digital Network, is really nothing more than a method of digitally accessing the Public Switched Telephone Network (PSTN) which itself is now largely digital internally. ISDN in Australia was launched by Telecom in 1989. It is available in two flavours: Macrolink, which is a Primary Rate service providing 30 64Kbps B channels and one 64Kbps D channel; and Microlink, a Basic Rate service which provides two B channels and one D channel.

The essential components of an ISDN network are shown in the figure on page 103. In this diagram the analogue PSTN service is shown as being integrated with the ISDN. This is not always the case, but occurs where the exchange (also known as the 'switch') being used can support both services. Some examples of integrated switches are the Alcatel System 12 and Northern Telecom DMS-100, both of which are used in Australia; and the NEC NEAX 61E exchange used in New Zealand.

The Ericsson AXE exchange widely used by Telecom Australia does not currently support both PSTN and ISDN services. The Australian ISDN network is thus provided by a network of AXE exchanges loaded with ISDN software which are then interconnected to the PSTN exchange network. This is also referred to as an 'overlay' network.

To simplify the description of an ISDN network I have omitted details of the physical delivery of the ISDN service. These are covered in detail later in this article. As can be seen in the diagram, the access to the B channel (a digital 64Kbps user channel) is controlled by signalling to the switch CPU via the D channel. The D channel operates at 16Kbps for a Basic Rate interface where only two B channels are being controlled, and 64Kbps for a Primary Rate interface where 30 B channels (23 B channels for US and Japan) are being controlled.

The D channel signalling is accomplished by a protocol described by CCITT Recommendation Q.931. This protocol is interpreted by the CPU of the local exchange and is re-mapped onto the internal inter-exchange protocol, Common Channel Signalling System Number 7 (CCS#7). It is this process which has added complexity to the software in the exchange. For an analogue telephone service a much simpler set of electrical pulses and currents are translated to less complex CCS#7 messages.



One area of great confusion to new initiates to ISDN technology is understanding how the D channel Packet Mode services operate. There are two distinct types of Packet Mode service that may be provided over the D channel.

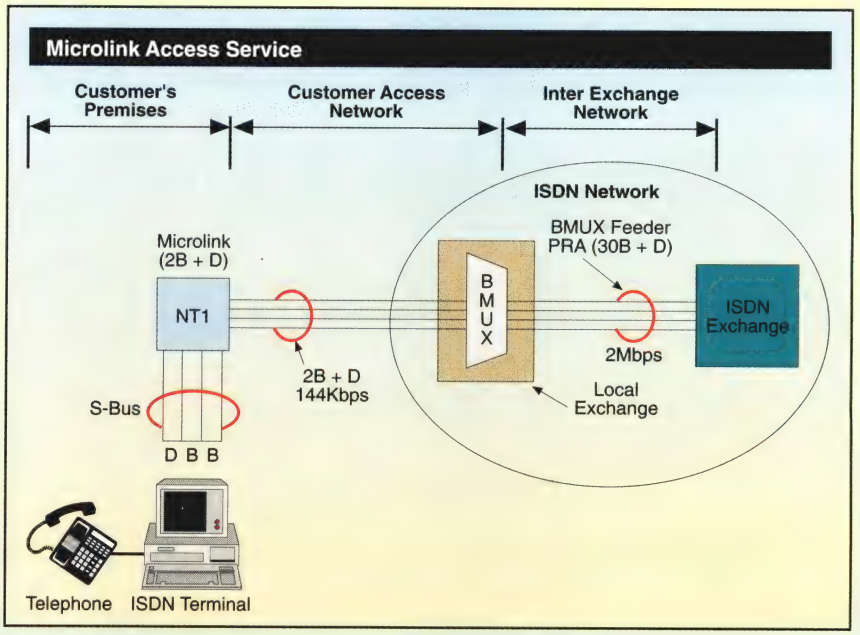
The first of these provides access to the Public Packet Switch Network, Austpac. This service is provided by sharing capacity on the access line. The Data Link Layer or LAPD has an address field known as Service Access Point Identifier (SAPI). This SAPI acts

Microlink Commissioning Procedures

Telecom Australia's Microlink service commissioning procedures can be split into two parts:

- Commissioning of the BMUX; and
- Commissioning of the Microlink customer service.

The diagram shows the physical access link from the customer's premises to the ISDN exchange for a Microlink service.



BMUX Commissioning

The BMUX (B-channel multiplexer) is a Telecom device located in the exchange which splits one Primary Rate into 14 Basic Rate streams. This was developed because the Ericsson AXE digital exchange originally used for ISDN in Australia could only handle Primary Rate interfaces. It was this fact which originally restricted the use of ISDN semi-permanent circuits for Microlink subscribers.

A BMUX can be placed in service subject to satisfactory completion of the following commissioning test procedures:

Power Supply and Feeding Tests

These tests verify the BMUX internal power supply levels and ensure that the BMUX Microlink port output over-current protection is functioning.

Alarm Monitoring Test

A connect-disconnect-connect test of the BMUX feeder Primary Rate Access is performed. This ensures that the Errored Second and Severely Errored Second alarms are functioning.

Feeder PRA Link Error Test

A 12 or 24 hour BMUX feeder PRA link error test is performed. The ISDN exchange is used to monitor the number of Errored Seconds on the link during the test period. The number of Errored Seconds must fall within Telecom's internal limits.

Metallic Access Test

For the Metallic Access Test an NT1 (Network Termination 1, an ISO layer 1 device which separates the user's equipment from that of the service provider) is connected to a specified BMUX Microlink line within the exchange. A Diagnostic Test of the ISDN U interface functionality for that line is then conducted. The Diagnostic Test provides a check on the following conditions and functions:

- DC continuity;
- Bit Error Rate; and
- NT1 loopback function.

The test results are reported to a Telecom Management Network Workstation.

Microlink Port Test (Test Call)

For the Microlink Port Test an NT1 and Test Terminal are connected, in turn, to each BMUX Microlink port within the exchange. For each port the following tests are conducted:

- Both local and NDD (National Digital Direct) test calls are made from the Test Terminal with the exchange;
- A Diagnostic Test is performed; and
- The NT1 and Test Terminal are disconnected from the Microlink port and the subsequent alarms are monitored on a Telecom Management Network Workstation.

Customer Service Commissioning

Only after satisfactory completion of the following commissioning test procedures can a Microlink be placed in service.

Transmission Loss Check

Before installation of a Microlink service it is mandatory that all Microlink access paths from the NT1 to the BMUX suspected of being greater than 3.4 kilometres in length, or having a transmission loss greater than 30 dB, undertake a transmission loss test. The Microlink service will only be provided on the condition that the service access path transmission loss proves to be less than 34 dB.

Link Error Test

A half hour Microlink access service link error test is performed during commissioning. The test monitors the entire access link from the NT1 to the ISDN exchange. The number of Errored Seconds, during the testing period, must fall within Telecom's internal limits. The test is performed using a Test Terminal connected to the NT1 at the customer's premises. Both B channels are looped back at the exchange allowing the Test Terminal to test the error performance of each in both directions.

as a routing switch at the telephone exchange. When the SAPI=16 the line interface card of the exchange switches the traffic out of the exchange to a packet handler and then to the Packet Network. For all signalling traffic the SAPI=0 and the messages are sent on to the Telecom exchange CPU for interpretation and remapping onto the CCS#7 signalling links.

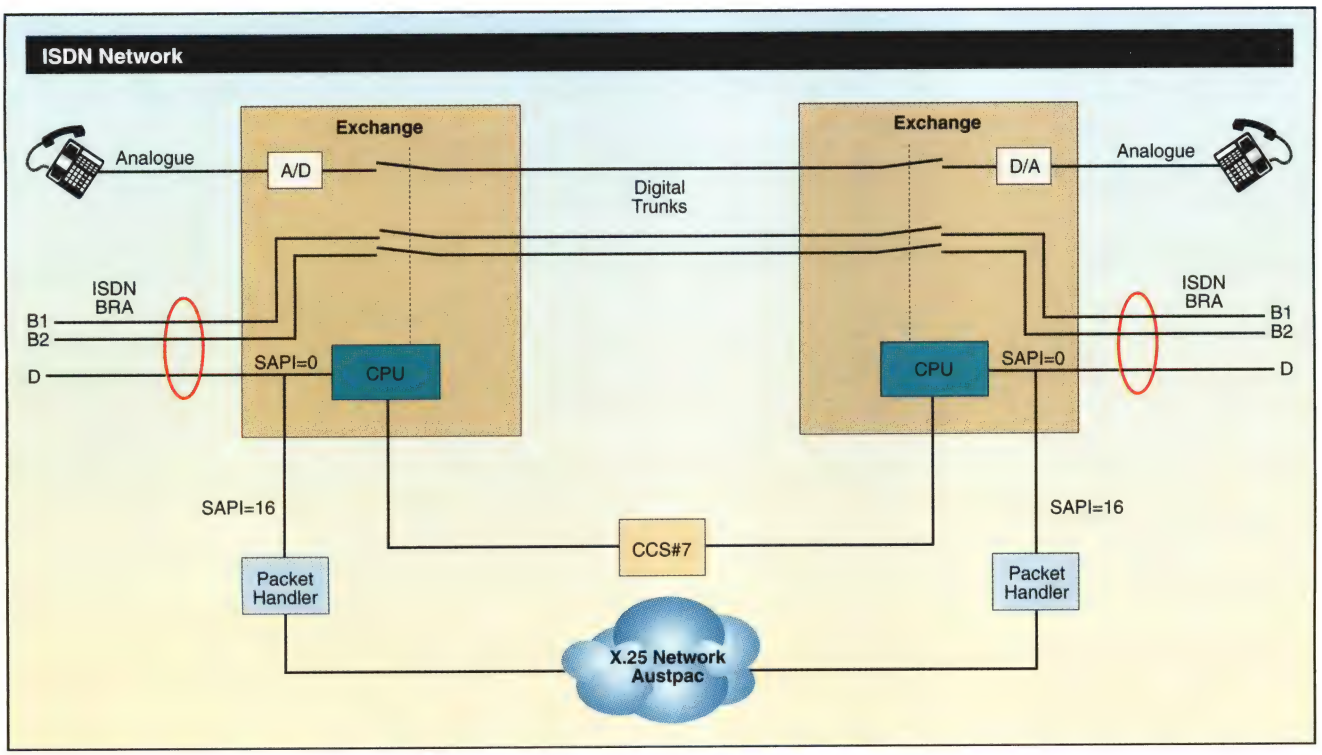
The access line can thus have data link traffic destined for the ISDN network interleaved with data link traffic destined for Austpac. If at some later date another type of data network such as frame relay were provided, another SAPI address could be allocated for routing this traffic. The D channel on the access line can thus be shared between several different networks.

The second type of Packet Mode service provided by the D channel actually operates within the ISDN network. The service is referred to as USER-to-USER messaging. In this case some USER data is either 'piggy-backed' to signalling traffic or sent in separate USER messages. The CPU in the exchange will remap this data into special USER-to-USER message fields for carriage through the CCS#7 network. There are several things to note about this service.

Firstly it operates as a datagram service. That is, there is no sequencing conducted by the network and no absolute guarantee of delivery. Secondly, since the CCS#7 signalling network carries the USER-USER message, tight flow control limits must be enforced. If this were not done then a user could paralyse the telephone network by flooding the CCS#7 network with USER-USER messages. Signalling traffic must always take precedence.

The particular flow control mechanism implemented in the Australian ISDN network makes the USER-USER messaging only suitable for short bursty transactional based applications. A real-time protocol will have great trouble operating without time-outs occurring due to this flow control mechanism. This is because the current implementation will only allow 102 messages to be sent every 180 seconds. If a user sends 102 messages in 100 seconds then the flow window is shut for 80 seconds until the next 180 second time period commences.

From the discussions above it can clearly be seen just how important the Common Channel Signalling System Number 7 network is for ISDN. Even though the customer interfaces to the ISDN it is in fact the CCS#7 linkages which dictate what services can or cannot be provided.



ISDN Usage

Now that ISDN has been available in Australia for several years what can we say about the way customers are using it? The largest use is for voice traffic from PABXs. Telecom Australia had a lot to do with this, because it introduced the Primary Rate interface first, along with attractive tariffing for long distance STD calls. The saving on STD calls is not as great now as it was when ISDN was introduced, but it still is cheaper.

The next largest group of applications would be backup for leased data lines plus videoconferencing. These applications have created a boom in ISDN multiplexers. These now have an added function known as digital channel aggregation which can provide a user data rate at any multiple of 64Kbps. This provides an attractive method of bridging LANs at high bit rates.

Looking back to the time of introduction of ISDN, a lot was said about the application of the D (signalling) channel. Telemarketing and other intelligent applications were cited as the big winners for ISDN. But in reality, this has not occurred. The reason most users have selected ISDN is that it provides switched bandwidth on demand. The PABX user has selected it because it provides a more cost effective way of connecting large numbers of trunk lines to the public network and can provide some savings on STD calls.

ISDN Difficulties

Since ISDN is still a relatively new technology, it can be expected that a few problems may occur during its implementation. However, this should not deter a decision to use it. The situation is very similar to taking a new software release on your computer system. You upgrade to take advantage of the new features, but recognise that you may find a few bugs along the way. Critical applications should not be immediately placed on ISDN until a customer has gained experience and confidence in its use. But note that some data applications may never go to ISDN, since it cannot provide the same reliability that the DDS service can.

- **Installation**

Installation troubles either occur at the customer premises or in the Telecom network. Sometimes it can be difficult to track down the fault since there are usually multiple parties involved in the installation, including the carrier, the equipment supplier and the customer. Good coordination and a willingness for all parties to work together on fault resolution are required.

Troubles encountered at the customer premises are usually wiring related. The first suspect to check is the Krone connections. For the uninitiated, Krone is a brand of wiring panel connectors used by Telecom for jumpering all telephone wires in Main Distribution Frames (MDF). These connection blocks are of the insulation displacement type, where wires are punched into a connector using a special tool. Since the ISDN connections operate at very high digital speeds, any looseness in the connection will cause trouble. The solution is to repunch the connection with the Krone tool.

Other problems that may occur relate to the wiring itself. For Primary Rate connection it is preferable to use shielded pair wire between the Krone connection and the equipment. For short distances ordinary unshielded pair can be used. The Basic Rate connection can be sensitive to wiring, just as LANs are. The first rule is not to use too small a diameter cable (standard 0.4mm is okay). Secondly, be careful of the orientation of the pairs. Basic Rate pairs are polarity conscious unlike Primary Rate pairs.

The NT1 operation is the next thing to check. Make sure the power indicator light is on. For a Primary NT1, if the circuit to the exchange is broken the power will be disabled and will need to be manually reset at the local exchange. This means that if the printed circuit board is lifted in and out of the NT1 box, or the wires to the exchange are disturbed, all power disappears and a service call to Telecom will be required to reset power.

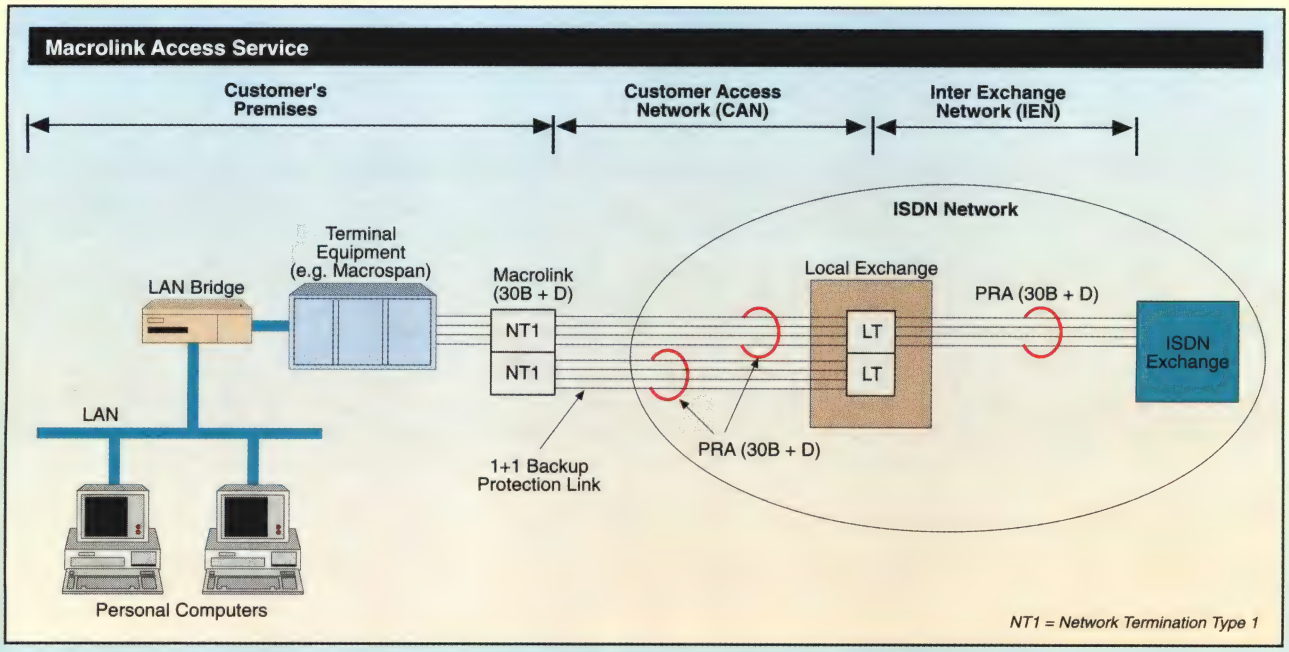
- **Transmission Faults**

In the past, many customers have had difficulties due to transmission faults within the Telecom network. Telecom is obviously sensitive to such criticism and has greatly improved the performance in this area. It is expected that these troubles will further diminish in time. The main culprits appear to be reliability of some of the new transmission plant used for ISDN plus the selection of good pairs within the Customer Access Network (CAN).

Some customers in remote areas have encountered troubles because they were connected to the Telecom network via radio bearers. ISDN can operate quite successfully over digital radio bearers, but great care should be taken on the routing so that fog and other environmental factors do not affect performance and reliability.

It should be remembered that Telecom has a diverse range of transmission bearer

Macrolink Commissioning Procedures



A Telecom Macrolink service can only be placed in service after the satisfactory completion of the following tests:

Fault Monitoring Test
With the 1+1 automatic backup link disabled, a bit stream is injected into each section of the access link. The resulting fault reports for each link section from the exchange are checked. This ensures that the link performance monitoring system is functioning satisfactorily.

Automatic Patching Test
The purpose of this test is to help verify that the Customer Access Network automatic backup configuration, shown in the Macrolink Access Service diagram above, will function correctly when placed in operation. All Macrolink customers have their first Primary Rate Access link in an automatic backup configuration.
The automatic patching test is performed by interrupting the main and backup Customer Access Network links in turn and verifying that changeover of the links occurs.

Link Error Test
The purpose of the Link Error test is to verify that the entire link from the Customer side of the NT1 to the ISDN exchange is performing satisfactorily and is within error limits. The number of Errored Seconds for each section of the access link, main and backup, are monitored for a 12 hour period.

equipment in its network such as copper pairs, digital microwave and fibre optic cables. All of these systems require a more disciplined approach to installation for end-to-end digital services.

- **Configuration Difficulties**

Most of the troubles that occur in this area are due to misunderstandings, either between the carrier and the customer or due to limited knowledge.

Firstly, it is vitally important to know exactly how your ISDN line has been configured by the carrier. For example, do you have 20 or 30 B channels operational on your Macrolink? Do you know whether these are all both-way, allow both incoming and outgoing calls, or are restricted to incoming or outgoing calls only? For sites with multiple ISDN interfaces with common numbering, do you know and understand the routing which Telecom has programmed into its exchange? It could have consequences for the processor loadings of the customer equipment. Do you know what range of numbers are allocated to your ISDN interface? If you have semi-permanent ISDN circuits, do you know what the reference numbers of these circuits are?

All of these types of parameters must be correctly known in order to correctly configure the equipment at the customer premises. A mis-match of configuration between network and equipment may cause calls to be rejected.

Other configuration areas to check are subscription services. Presently there are two: Calling Line Identification (CLI), and Malicious Call Trace (MLCT). The MLCT service is currently free but must be subscribed to for it be enabled. Many more services will be offered in the future.

- **Interworking Problems**

These problems are perhaps the most difficult to track down. There are two specific types of end-to-end ISDN interworking difficulties. The first is due to different codings within compatibility elements. The CCITT has not done a good job of defining exactly the correct codings required for each type of application. As some Information Elements (IEs) are only optional, some manufacturers include them within the message while some don't. But the real trouble can occur when the terminal receiving a call actually checks for this field. In a test which Telecom conducted with a number of ISDN terminal adaptors on the market, it discovered some four variations of codings.

The second interesting area of interworking problems are for actual errors in IE codings. What occurs here is that some equipment will detect the coding error while others may not. A specific example may help to illustrate the dilemma: A coding error occurred in one PABX software release where the value used in the Progress Indicator field was set to 0. This value has no meaning since it has not yet been allocated. The AXE exchange did not detect this but merely passed the call through to the destination end. The call was connected at the receiving end by all equipment except by one manufacturer's PABX that actually checked this field and disallowed the call.

International applications can present other signalling problems. The signalling links between international carriers are not all CCS#7, and, where they are, the newer ISUP or ISDN User Part of CCS#7 has not been implemented. What this means for the user is that various signalling elements will not transit through these links.

An example of the type of problems that this can create is as follows: A large multinational company is setting up backup data links between Australia and Hong Kong. The end user equipment operates at a speed of 9,600bps only. ISDN terminal adaptors (TAs) are purchased to reduce the speed from 64Kbps to the 9,600bps user rate.

IT'S HARD TO GET A PHONE CONNECTED WITHOUT GOING THROUGH JNA.

Telecom's customer service is really switched on with the help of network communications technology from JNA.

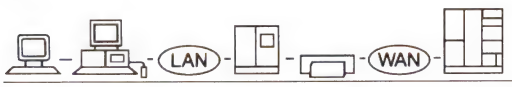
This technology, integrated with Telecom's AUSTPAC service, forms what is arguably Australia's largest OSI network. Operators throughout Australia now field all kinds of customer enquiries from a single desktop PC, accessing and exchanging data from three different computer systems - IBM, Honeywell and Digital.

Previously, three separate terminals would have been needed to do the same job.

JNA's Network Integration knowledge is at the forefront of today's climate of open environment computing. JNA's engineers are the quiet achievers assisting Australian industry for over 30 years.

If your needs are to distribute the computing power of your organisation, a phone call to JNA could have you well connected.

Sydney 417 6177 Melbourne 532 8555 Canberra 248 5422
Brisbane 870 3434 Perth 481 4034 Adelaide 338 2511 Darwin 81 1499



JNA

J401

POINTING THE WAY TO CLEVER COMMUNICATIONS

These employ a rate adaptation scheme known as CCITT V.110. A problem now exists in that the called TA will not receive signalling information indicating user data rate, parity, stop bits and other parameters. This information is usually passed through the D channel and then via CCS#7 to the remote end. The analogy here is that of an auto-ranging modem that signals to the distant end what speed to select.

To overcome this problem it's necessary for the user to ensure that the TA which he wishes to purchase can be manually configured to a fixed speed at each end in addition to the usual ISDN signalling techniques.

- **Operational/Functional Difficulties**

This category of difficulties covers issues of equipment design and both hardware and software. They are caused by a mis-match between customer expectations and what the equipment can actually deliver.

We all know how suppliers can tend to exaggerate the capabilities of their equipment or how a salesman will say yes to something without understanding the true capability of the equipment they are selling.

The trickiest problems to find out about are the ones dealing with particular combinations of calls or connections that a customer may wish to use. It is often a good idea to write down all the types of call/connection types expected before you see a supplier. Perhaps the combinations you require may not be available until a later software release.

Sometimes the difficulty may be due to hardware design. For example, one piece of equipment on the market several years ago suffered from severe overheating problems. Other problems may be that the equipment does not support all the hardware interfaces that are required.

The main point is to know exactly what functionality you want, what minimum functionality you can accept, and exactly what the supplier can offer now and later.

- **Diagnostic Aids**

In order to unravel some of the problems that may occur within an ISDN implementation a few tools may be useful. A protocol analyser is extremely useful. Depending on the sophistication required these can cost from $16,000 to up to and over $100,000. I have found that a locally produced protocol analyser, which is relatively cheap, is more than adequate.

However, the main limitation I have found using these analysers is that they never display exactly what you want to see in the format you'd like. The other thing I find is that analysing a protocol trace on an active line can be tricky since many different calls may be active at a given time. This means that the trace of one call is interleaved with many others.

To overcome these difficulties and to make life easier, a post trace software analysis program is a good investment. Use the protocol analyser to store all of the ISDN traces to a disk file. Then write a program that formats the trace the way you want it.

In my case, I had a program strip out only things like calling/called numbers, cause codes, message types, etc. Now since the trace is ordered in real time all the calls will be interleaved. It becomes a relatively simple matter to run a sort program with Call Reference being the key and presto, all calls will now be sequential rather than interleaved.

This can be used to great advantage for determining the health of an ISDN line. For large PABX sites this is particularly useful. I am currently using this technique for a large national ISDN user to supplement information obtained from the user's Telephone Information Management System. It is not difficult to add to the the protocol analysis program a report generator that can give useful statistics such as the call rate, channel utilisation and call success rate. Its key advantage over TIMS is that the information can be gathered and analysed within a very short space of time without interfering with the PABX operation. Since TIMS works at a system level it can take a while to produce reports. The main disadvantage of using the protocol trace data for statistics is that it can only be obtained from one ISDN interface at a time. This could be an annoyance for a site with a large number of primary rate interfaces.

Work Together

A lot of time in ISDN problem resolution can be saved by taking notice of some of the tips given here. Far too much time can be wasted by suppliers and carriers spending too much time debating who owns the fault rather than working together for a speedy resolution. Faults can occur in quite a range of different areas. Diagnostic aids such as the one outlined above can help in tracking down the random ones. It may also disclose faults which you may not be aware of such as configuration difficulties.

ISDN has much to offer for the user but without some understanding of the complexities involved hard lessons may be learned. With a good understanding of both its problems and potential, business can obtain much greater benefit from the use of ISDN.

Greg Smith is Principal Consultant of Melbourne-based Envision Communications, an independent consultancy specialising in ISDN. He participates in a number of ISDN committees such as the Austel Working Group for standards TS13 and TS14, and is Chairman of the ISO Committee for Private ISDN Standardisation. He also provides ISDN training courses through the Housley Communications seminar company. *He would like to acknowledge a significant contribution to this article from the Telecom Australia ISDN Product group on the subject of ISDN commissioning procedures.*

Jtec

Solutions

Mission Critical

...a statement that sums up the telecommunications requirements of Australian Airlines for services such as Telephony and Data Communications.

If this sums up your business requirements then choose the Networking options that the experts choose...

nications Solutions applied with business sense

Head Office
Jtec Pty Limited
ACN 003 169 088
Unit 3
118 - 122 Bowden St
Meadowbank 2114

Phone	
International	612-809-6933
Sydney	02-809-6933
Melbourne	03-263-0200
Brisbane	07-229-9137
Canberra	06-256-3480

Fax	
International	612-809-6619
Sydney	02-809-6619
Melbourne	03-263-0215
Brisbane	07-221-6625
Canberra	06-201-3003

Proteon.

Nobody has a better track record in Token Ring internetworking.

As networks become linked, it is reassuring to know Proteon is involved in supplying the physical interconnectivity.

Proteon, pioneers in Token Ring technology, provide the adaptors, smart hubs, bridging routers and network management, fundamental in connecting diverse hardware platforms. Network environments based on IBMs SNA, DECs DECNET and the myriad range of PC Lan and UNIX workstations can all be connected by Proteon's advanced internetworking infrastructure.

1st in Harvard Benchmark Test

Proteon's RISC-based CNX 500 Bridging Router has rated top performer in the 1991 and 1992 Harvard Benchmark Test. This independent test measures speed and throughput in multi-LAN, diverse environments among 15 of today's vendors of bridges and routers.

It is not surprising that top Australian companies who are bringing their remote and local networks together on a price/performance basis are turning to Proteon.

Free Internetworking Booklet

If you would like to know more, write for a free copy of "Taking the Mysteries Out of Internetworking – A Manager's Guide", or contact Rob Willis on (02) 412 0050.

proteon

Token Ring to Everything.

INTELLIGENT HUBS • BRIDGING ROUTERS • OPEN SYSTEMS MANAGEMENT • 4/16 CARDS

P499

Token Ring Adaptors Evaluated For the Enterprise

Token Ring network adaptor tests which simply measure how fast adaptors can shoot frames onto a network aren't true performance indicators. The right approach is to test a mix of representative frames.

Most tests of Token Ring adaptors look more like dress rehearsals for the St Valentine's Day Massacre than engineering-calibre evaluations. The usual approach involves counting how quickly adaptors can blast short frames onto a network, with those delivering the biggest barrage declared 'top products.' This may be a good way to test tommy guns, but it leaves a lot to be desired when internetworking gear is under scrutiny.

To start with, the unrelenting bursts of frames that these trigger-happy tests fire in one direction bear no resemblance to the sort of traffic patterns found in real-world applications. Such inherent inaccuracies might be irrelevant (though in no way reduced) if LANs were still restricted to workgroups: Terminal-to-host access or small client-server applications like downloading files from a server typically under-utilise an adaptor card.

But it's a very different story when internetworked PCs, minicomputers and mainframes share mission-critical data. At this point, any test that does not indicate how products can be expected to perform in the real-world must be discarded as fatally flawed.

For these reasons, then, when the Data Comm Test Lab decided to see how well the latest 16Mbps Token Ring adaptors can deliver the throughput needed by today's high-performance enterprise applications, it ruled out the bit-blaster approach right from the start. Instead, it devised a new benchmark that includes LU6.2 (IBM's peer-to-peer protocol), OS/2 2.0 with Version 1.0 of Extended Services, and the Network Device Interface Specification (NDIS) — the emerging open standard for network adaptors. This is the first time that NDIS has been put through its paces to get a sense of what sort of performance it can deliver.

All in all, a total of 50 Mbytes of data were shunted between applications running on a pair of 80486-based PCs configured as Advanced Peer-to-Peer Network (APPN) End Nodes (another industry first). A wealth of different-sized frames were used, ranging at the low end from the 256- and 1,024-byte exchanges commonly used for terminal emulation, through the 4,000- and 8,000-byte frames associated with large file transfers, to (wherever possible) the 16,000 byte behemoths that approach Token Ring's theoretical maximum. The Lab also looked at factors affecting overall throughput, including frame size, the number of frames sent in between acknowledgments, and memory-access scheme.

Surprise Endings

When all the tests were complete and the results tallied, the Lab made some startling discoveries:

- Although Ethernet adaptors are now truly commodity products thanks to their large installed base and continuing high sales volumes, their Token Ring counterparts exhibited an unexpected range of performance, with the fastest adaptors outpacing the slowest by almost 1 Mbyte/second.
- Many adaptors could not accommodate the larger frames characteristic of high end, peer-to-peer computing and the most efficient means of transferring data.

Table 1: Token Ring Adaptors: The Test Lineup

VENDOR	PRODUCT	BUS	BUS MASTERING	CHIP SET	NDIS DRIVER RELEASE	MAX. FRAME VERIFIED (BYTES)	PRICE
Digital Communication Associates Sourceware (02) 427 7999	Irmatrac	ISA	Yes	TI TMS380	2.0.3	16,411	$1,029
	Irmatrac	MCA	Yes	TI TMS380	2.0.3	16,411	$1,029
IBM 13 24 26	Token Ring Network Adaptor II†	ISA	Yes	IBM Tropic	1	16,411	$1,306
	Token Ring Network Adaptor A	MCA	No	IBM Tropic	1	8,221	$1,413
Madge Networks DDP (02) 906 1200	Smart 16/4 AT Ringnode	ISA	Yes	TI TMS380	1.3	16,411	$1,562
	Smart 16/4 MC32 Ringnode	MCA	Yes	TI TMS380	1.3	4,123	$2,316
	Straight Blue 16/4 MC Adaptor	MCA	No	IBM Tropic	1.3	1,947	P.O.A.
Olicom Force Technology (02) 971 1000	ISA 16/4 Adaptor	ISA	Yes	TI TMS380	5.3	16,411	$1,050
	MC 16/4 Adaptor	MCA	Yes	TI TMS380	5.3	16,411	$1,050
Proteon Com Tech (02) 317 3088	P1392 Network Interface Card	ISA	Yes	TI TMS380	2.02	4,123	$1,404
	P1892 Network Interface Card†	MCA	Yes	TI TMS380	2	4,123	$1,404
Standard Microsystems (02) 238 2206	Tokencard Elite	ISA	No	Proprietary	1.1	4,123	$1,212
	Tokencard Elite A	MCA	No	Proprietary	1.1	4,123	$1,212
Thomas-Conrad Merisel (02) 882 8888	Token Ring Adaptor MC†	MCA	Yes	TI TMS380	2.2	16,411	$1,220
3Com (02) 959 3020	Tokenlink III 16/4	ISA	No	IBM Tropic	1	15,387	$1,050
	Tokenlink III 16/4	MCA	No	IBM Tropic	1	1,947	$1,130

ISA = Industry Standard Architecture
MCA = MicroChannel Architecture
NDIS = Network Device Interface Specification
Tropic = Token Ring Protocol Interface Controller
† Tester's Choice

- Although the new Tropic (Token Ring Protocol Interface Controller) chip set from IBM and National Semiconductor was expected to deliver unprecedented performance, it turns out there's more to throughput than silicon. The third-party Tropic implementations the Lab looked at exhibited lacklustre performance, yet IBM — by combining Tropic with enhanced memory access and finely tuned drivers — has shown that its chip set can turn an ISA adaptor into a real screamer.

Given the diverse applications found on today's corporate networks, the only way to accurately assess performance of 16Mbps Token Ring adaptors is by seeing how well they handle a mix of representative frames. The Data Comm Test Lab's Tester's Choice awards earned by the top performers this time out reflect this belief. All products were scored for their abilities with 256-, 512-, 1,024-, 2,048- and 4,096-byte frames. Each category was weighted according to its importance, and all scores were averaged. One award went to an ISA adaptor — IBM's peerless Token Ring Network Adaptor II — and a pair of prizes went to MCA cards —the P1892 Network Interface Card from Proteon, and the Token Ring Adaptor/MC from Thomas-Conrad.

The Outer Limits

The Lab decided to limit testing to products for either ISA or MCA (the most popular buses on the market), looking at adaptors from eight vendors (seven ISA, nine MCA). No vendors that simply re-label another supplier's product were asked to supply adaptors. Further, only manufacturers firmly established in the Token Ring market or those with products that boast new technology or features were contacted. This last criterion is admittedly subjective; the Lab made its choices based both on market share and on its own knowledge. Still, only a few vendors were left out.

The 16 products examined are a good cross-section of what the market has to offer (see Table 1 above). The technology used to build Token Ring adaptors can be roughly grouped into four categories, and the Lab looked at products from each. (Thus, even network managers considering an adaptor the Test Lab didn't evaluate should have no real problem applying the Lab's findings to other products).

Placed in the first technology category are Token Ring adaptors that make use of the chip set and drivers developed by Texas Instruments (TI). Third-party suppliers of adaptors, bridges, and routers began to work with TI's hardware and software soon after IBM introduced Token Ring networks in 1985. Digital Communications Associates is the only vendor in this category whose product the Lab checked out.

In the second category are Token Ring adaptors that use TI hardware and optimised software drivers, a group that includes Madge Networks, Olicom and Proteon.

In the third group are Token Ring adaptors that use the new Tropic chip set built by IBM and distributed through National Semiconductor. IBM has been making its own chips for years, but only recently decided to sell silicon to outsiders. It represents a welcome second source for Token Ring chip sets, and its entry into the market is one reason for the recent speculation that higher-performing adaptors will soon be available. 3Com puts Tropic to work in its adaptors, and Madge has added an entire line of ISA and MCA adaptors built with Tropic — its Straight Blue adaptors.

In the fourth group are Token Ring adaptors that use proprietary chips and software, like Standard Microsystems Corporation.

The Performing Arts

Since Token Ring adaptors do little else besides move data from one location to another, performance is a major factor affecting purchasing decisions. Other issues, like how easily an adaptor can be installed and configured, are secondary considerations. Other key areas, such as network management and interoperability, will be addressed in future tests.

Performance is affected by a number of variables. Some, such as the chip set used, memory-access scheme, or degree to which the drivers have been optimised, are beyond

a network manager's control. Others, particularly the size of the frame that the adaptor sends across the network and the number of frames that can be sent before an acknowledgment is returned, can often be fine-tuned by users.

In general, the larger the frame, the more efficient the data transfer. Since every frame processed by the adaptor exacts some performance overhead, fewer frames sent across a network mean less wasted bandwidth. Frame size is usually controlled by the communications software used with an adaptor. Token Ring LANs allow a maximum frame of about 18,000 bytes.

It's important to realise that specifying a large frame merely gives the adaptor the option to use that size if necessary. Smaller frames will be used automatically if needed.

Window size, like frame size, is usually controlled by the communications software. It specifies how many frames can be transmitted before an acknowledgment must be sent to confirm error-free reception. Most comms packages, including the one used by the Test Lab, come with a default setting of 1 (an acknowledgment must be returned for every frame sent). This default is a 'safe' setting insofar as there is virtually no chance of overrunning buffers or overloading a network. And should an error occur, only a small amount of data must be retransmitted.

On the other hand, setting the window to 1 severely compromises performance by making the application wait for each frame to be acknowledged. For this reason, the Lab chose a setting of 8 for these tests, the maximum allowed by Extended Services. Again, the setting indicates the maximum window size, not the required size.

In and Out the Window

In order to illustrate how frame and window size affect performance, the Lab transferred 50 Mbytes of data between PCs using a pair of Olicom MCA adaptors. The actual transaction ships 100,000 bytes of data; it was repeated 500 times in order to develop a benchmark for sustained throughput. That benchmark gave the Lab a value measured in megabits per second, which was used to estimate the relative transfer time needed to move 25 Mbytes of data (see Table 2). The exchange was made using three different-sized frames (1,024, 2,048 and 4,096 bytes) and eight different windows (set from 1 through 8). What the Lab discovered is that larger frames drastically improve performance. Even with the window throttled back to 1, increasing the size of the frame from 1,024 to 4,096 bytes slashed estimated transfer time from 54 to 31 seconds.

Performance improvements are equally dramatic when the size of the window is increased. The file transfer using 1,024-byte frames took 54 seconds with the window set to 1; this time was cut almost in half as the window size was increased. Similarly, when

Figure 1: MCA Token Ring Adaptors

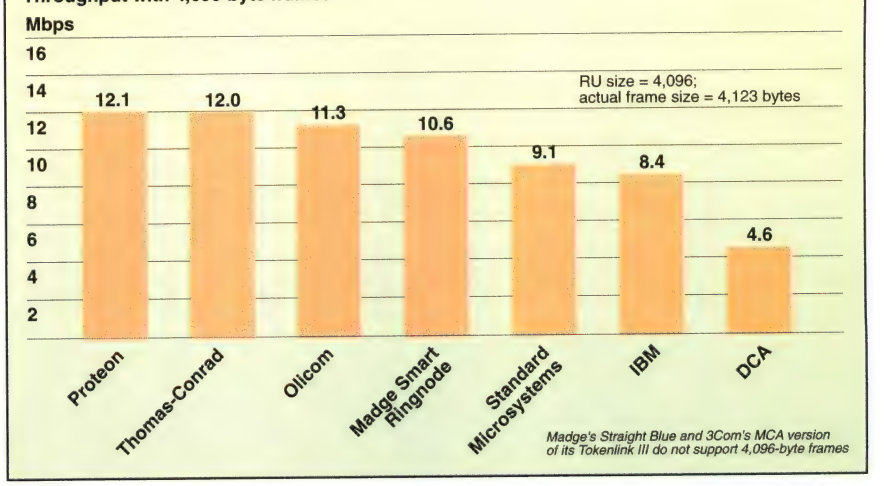
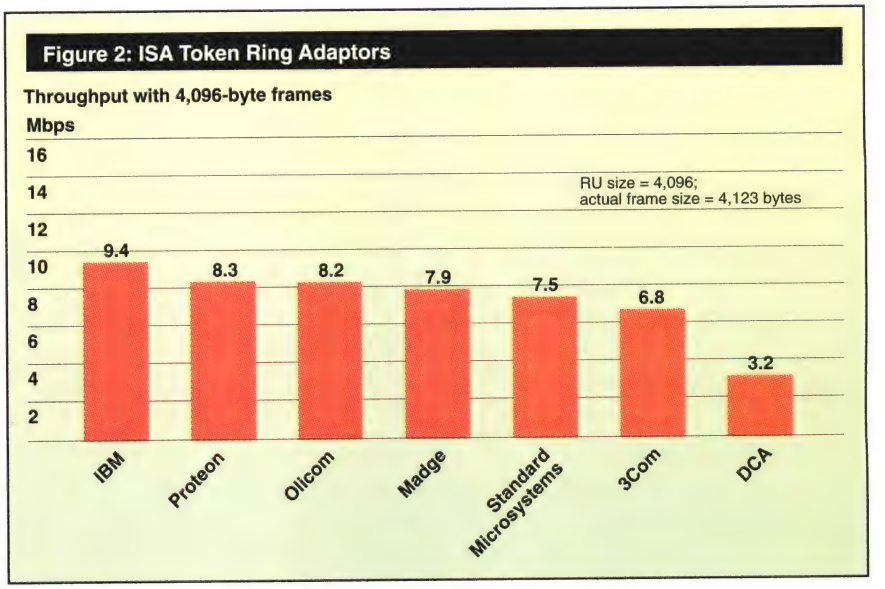


Figure 2: ISA Token Ring Adaptors



4,096-byte frames were used, file transfers took 31 seconds when the window was set at 1, which dropped to 18 with the window set to 3. (Because of the characteristics of the application and the networking gear, once the window setting was changed to 4, no further improvements were observed.)

By choosing an adaptor that lets larger frames be specified and setting the comms software for larger windows, it is possible to boost performance significantly. Most of the vendors tested support frames of up to 4,096 bytes.

3Com's MicroChannel version of the Tokenlink III adaptor and Madge's Straight Blue MCA adaptor do not accommodate 4,096-byte frames, which is a significant shortcoming. (More accurately, if these adaptors handle 4,096-byte frames, neither the Lab or the vendor's US technical sup-

Table 2: A Window on Better Performance

Frame size (bytes)	Window size (number of frames sent before acknowledgement)							
	1	2	3	4	5	6	7	8
	Transfer time (seconds)							
4,096	31	21	18	18	18	18	18	18
2,048	39	24	23	22	22	21	21	21
1,024	54	31	30	29	28	28	28	27

Total size of data transfer = 25 Mbytes

Table 3: Weighted Winners — MCA

Overall performance of MCA adaptors

	256 BYTES	512 BYTES	1,024 BYTES	2,048 BYTES	4,096 BYTES	COMPOSITE SCORE
Weight	5%	10%	15%	20%	50%	
Thomas-Conrad	9.4	9.7	9.3	**10.0**	9.9	9.8
Proteon	8.7	9.0	8.5	9.5	**10.0**	9.5
Olicom	**10.0**	9.9	9.2	9.2	9.3	9.4
Madge Smart Ringnode	9.5	**10.0**	**10.0**	9.7	8.7	9.3
IBM	9.3	9.3	8.1	7.7	6.9	7.6
SMC	7.2	7.6	7.2	7.5	7.5	7.5
3Com	9.4	9.3	8.1	3.3	2.8	4.7
Madge Straight Blue	9.3	9.3	8.1	3.3	2.8	4.7
DCA	7.3	6.2	4.9	4.3	3.8	4.5

port staff were able to figure out how to set the adaptors correctly.)

As the Lab discovered, improved performance can be had all the way up to and including 8,192-byte frames. Unfortunately, Thomas-Conrad, DCA, Olicom and IBM were the only MCA vendors who supported this size. On the ISA side, only IBM, Olicom, Madge, 3Com, and DCA accommodate 8,192-byte frames. Other vendors said they were working on this capability. In this round of tests, 4,096 bytes was the largest frame used in determining the Lab's Tester's Choice awards.

Getting on the Bus

The way an adaptor transfers data to and from the host PC's memory also can affect performance. Bus mastering (also often referred to as direct memory access, or DMA) and shared memory are the most popular schemes. With the former, the adaptor is intelligent enough to seize control of the PC bus and actually oversee transfers, thus freeing the PC's CPU for other tasks. In other words, transfers from the adaptor's buffers to PC memory can be accomplished in just one step.

If a Token Ring adaptor doesn't use bus mastering, it most likely employs shared memory. With this approach, the adaptor moves data from the network into onboard memory and then instructs the PC's CPU to copy it to main memory. The two-step process is overseen by the PC's CPU.

New World Order

As discussed, the Lab was particularly concerned with addressing the short-comings of typical Token Ring adaptor tests. Such efforts usually employ a frame generator or a program like Perform 3 from Novell to create test data for the adaptor to transmit.

Perform 3, or any other NetWare-based test program, was ruled out for several reasons. For one thing, Novell's IPX/SPX protocol stack is not a top performer. What's more, NetWare's maximum frame size is roughly around 4,000 bytes; as indicated, larger frames on Token Ring networks can significantly boost performance. Finally, no corporations use NetWare alone.

Instead, the Lab chose a pair of public-domain LU6.2 applications to generate realistic test data. Called BFILECLL and BFILESVL, they were downloaded from IBM's APPC Developer's Forum.

The applications have all the functions and characteristics needed to accurately simulate typical corporate computing environments. By requiring acknowledgements, they mandate two-way communications. They're high performance: The LU6.2 stack has achieved throughput to 12Mbps, or roughly 75% of the available bandwidth on a 16Mbps Token Ring LAN. Further, the LU6.2 applications also allow frame sizes to 16,000 bytes.

The Test Bed

Separate test beds were constructed with ISA PCs and with MCA PCs. The former were IBM PS/Valuepoint PCs with 25MHz 80486SX processors and equipped with 8 Mbytes of RAM. The latter were IBM PS/2 Model 76s with 33MHz 80486s and 8 Mbytes of RAM. The PCs ran under OS/2 Version 2.0; IBM's Extended Services 1.0 supplied the LU6.2 protocol stack. We selected OS/2 because it is a high-performance operating system and is preferable to DOS for LU6.2 applications.

The tests were described to the vendors before they were run and the adaptors configured according to vendor instructions. All but one vendor said to use default parameters. After they were shown preliminary test results, though, some asked that some parameters be changed. The changes were made and the tests repeated.

Performance was measured by LAN analysers connected to the Token Ring. A Foundation Manager from Protools recorded the average bytes and frames-per-second counts. A DA-30 from Wandel & Goltermann Technologies was used to verify the frame rates, and a Sniffer from Network General made sure the adaptors were actually delivering the frame sizes that they were set for.

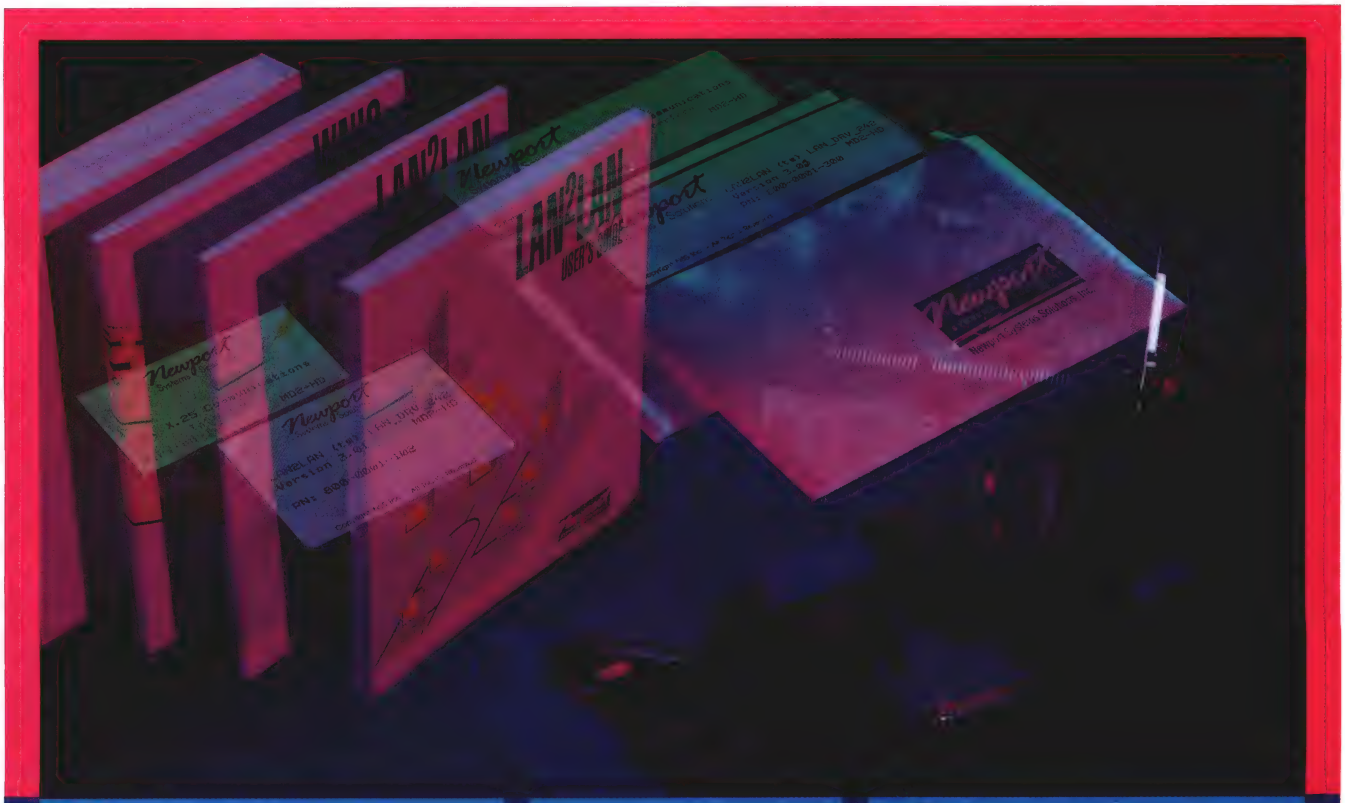
The Lab ran seven tests on each adaptor, each of which was repeated at least twice to ensure consistency. Essentially, the tests differed in that the LU6.2 communications software was set to use different frame sizes. This was done by varying the SNA RU (Request Unit or Response Unit, depending on what the frame carries). RU size determines the portion of an SNA frame dedicated to data. Thus, the actual frames on a network are slightly larger than the RU, because SNA, LLC (Logical Link Control), and MAC (media access control) headers take up some room. For example, an RU of 256 bytes produces a frame of 283 bytes. The test suite consisted of seven different-sized RUs: 256, 512, 1,024, 2,048, 4,096, 8,192 and 16,384 bytes.

Table 4: Weighted Winners — ISA

Overall performance of ISA adaptors

	256 BYTES	512 BYTES	1,024 BYTES	2,048 BYTES	4,096 BYTES	COMPOSITE SCORE
Weight	5%	10%	15%	20%	50%	
IBM	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**
Olicom	9.4	8.9	8.6	8.9	8.7	8.8
Proteon	8.0	7.8	7.8	8.5	8.8	8.5
Madge Smart Ringnode	8.4	8.1	7.9	8.5	8.4	8.3
SMC	6.9	6.9	7.1	8.0	8.0	7.7
3Com	8.7	8.1	7.6	7.8	7.2	7.5
DCA	7.0	5.8	4.5	4.0	3.4	4.1

LAN²LAN internetworking.



LAN²LAN/MPR standalone router

- LAN and WAN routing
- Routes IPX, TCP/IP
- MAC-layer bridging
- Spanning tree protocol
- Streamlined routing OS
- SNMP MIB II management
- Remote console

Common Features

- 4:1 data compression
- Speeds to T1/E1
- Multiple ports
- Load balancing
- Field upgrading
- CCITT HDLC LAPB
- CCITT X.25
- PPP

LAN²LAN/Mega for NetWare platforms

- WAN routing only
- Routes IPX, TCP/IP, Appletalk
- v3.x NLMs
- NetWare file servers
- NetWare Runtime and MPR
- ISA and MCA support

Compare the specs and features of Newport's LAN²LAN internetwork solutions and you'll see that nothing else comes close to combining so much sheer capability and performance at such competitive costs.

Novell NetWare Aware

Versatile LAN²LAN/MPR routers do both routing and bridging. As standalone routers, they easily connect networks using NetWare, LANtastic, LAN Manager, LAT, DEC, Banyan Vines and other operating systems. Both LAN²LAN/MPR and LAN²LAN/Mega use PPP. This provides complete interoperability with existing routers, while allowing network expansion at significantly lower cost.

LAN²LAN/Mega routers for NetWare platforms save costs in "outer LAN" configurations because they can be installed in a remote file server. You don't have to buy a separate PC, monitor, or NIC card.

PC MAGAZINE EDITORS' CHOICE September 10, 1991 LAN2LAN/Mega Router

The unique LAN²PC router gives you high speed connections from your LAN to remote PCs. It supports data compression, IPX, IP, and AppleTalk routing protocols, as well as HDLC, X.25 and PPP WAN protocols.

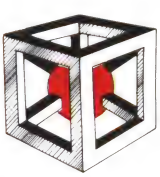
LAN TIMES READERS CHOICE 1991

LAN²LAN routers let you buy what you need now, then upgrade in the field later. Over 10,000 LAN²LAN routers are installed worldwide, proving their capabilities year in, year out.

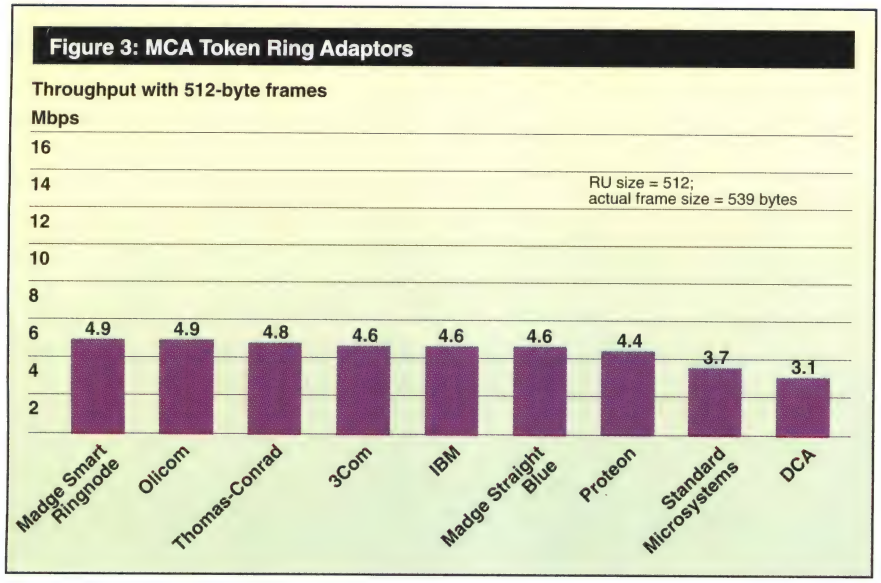
LAN²LAN solutions. Find out about the power of high performance, low cost internetworking.

(02) 901 3655

Fax: (02) 906 2247



LAN SYSTEMS



Test Results

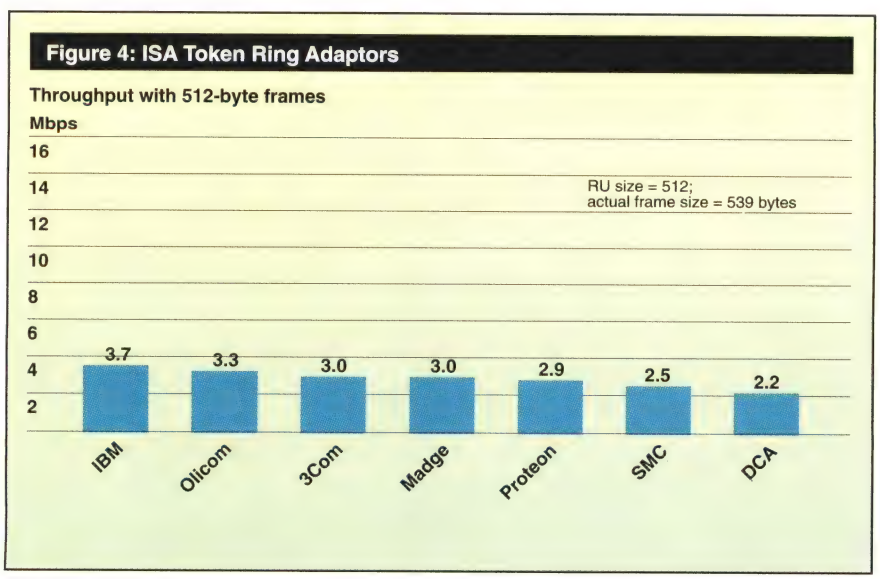
Overall, the Lab found that many of the adaptors evaluated deliver first-rate performance. The real screamers in the Micro-Channel group when tested with the 4,096-byte frames most suited to file transfers were Proteon and Thomas-Conrad, which finished in a near dead heat, with 12.1 and 12.0Mbps (see Figure 1 on page 111). Olicom wasn't far behind, with 11.3Mbps, followed by Madge's Smart Ringnode, with 10.6Mbps. Standard Microsystems delivered 9.1Mbps, while IBM reached 8.4Mbps. DCA's Irmatrac adaptor was at the bottom, with 4.6Mbps. As noted, neither Madge's Straight Blue nor 3Com's Tokenlink III supports 4,096-byte frames.

The top ISA adaptor when tested with 4,096-byte frames belonged to IBM, which led the pack with a throughput of 9.4Mbps; Proteon and Olicom followed, with almost identical performances of 8.3Mbps and 8.2Mbps (see Figure 2 on page 111). Performance decreased steadily, but not dramatically: the Smart Ringnode from Madge rated 8.0Mbps; Standard Microsystems, 7.5Mbps; and 3Com, 6.8Mbps. DCA was last, with a throughput of 3.2Mbps.

The top MCA adaptors when tested with 512-byte frames were Madge's Smart Ringnode and Olicom's MC 16/4 (see Figure 3). Apart from last-place finishers Standard Microsystems with 3.8Mbps and DCA with 3.0Mbps, the rest of the vendors were right on the heels of the leaders.

IBM once again nabbed the top spot among ISA adaptors when tested with 512-byte frames, with a throughput of 3.7Mbps (see Figure 4). Olicom, which came in at second spot, delivered 3.3Mbps. DCA finished in last place, with 2.2Mbps.

The slower performance of ISA adaptors can be attributed to several factors, including the Lab's choice of PCs. ISA performance also may be influenced by vendor design decisions. Unlike the EISA bus, the ISA bus is not regarded as an interface for high end servers, so there may not be as much concern with performance when designing products.



Weighted Winners

As mentioned, the Lab used performance with 256-, 512-, 1,024-, 2,048- and 4,096-byte frames to determine the winners of the Tester's Choice awards. But not all frames are equally representative of the traffic typically found on corporate internets. Thus, the Lab also decided to weight the five different-sized frames used in its tests to represent their importance to enterprise traffic.

The largest frames were deemed to be the most significant: A weighting of 50% was assigned to 4,096-byte frames, followed by 20% for 2,048-byte frames, 15% for 1,024 bytes, 10% for 512 bytes, and 5% for 256 bytes. The top adaptor in each category was awarded a 10, and the scores for all other suppliers were determined by dividing their throughput into the leaders. In other words, a vendor that scored a 9.4 achieved 94% of the throughput turned in by the top vendor. Finally, a composite score was determined for each vendor which formed the basis for the Tester's Choice awards. When it came to MCA adaptors, Thomas-Conrad and Proteon finished top, with composite scores of 9.8 and 9.5 (see Table 3 on page 112). In the evaluation of ISA offerings, IBM took top place across the board (see Table 4 on page 112).

Even though it didn't use the results to determine Tester's Choice awards, the Lab did look at performance with 8,192- and 16,384-byte frames. It found that throughput increased dramatically with 8,192-byte frames (just as it did as frames were increased from 256 to 4,096-bytes). Among MC adaptors, Thomas-Conrad achieved a performance of close to 12.8Mbps; Olicom, nearly 12Mbps; IBM, 8.4Mbps; and DCA, 4.6Mbps. No other MCA vendors supported 8,000-byte frames. Among ISA products, IBM delivered 9.8Mbps; and Olicom, 9-Mbps. Madge and 3Com both achieved 6.9Mbps; and DCA 3.1Mbps. Given the performance improvements with these frames, vendors unable to accommodate 8,192-byte frames should be looking at addressing this short-coming as soon as possible.

It's another story with the large 16,384-byte frames. At this point, throughput began dropping off: The data load was too much for the adaptor; buffers proved inadequate; and moving data from one internal location to another became a sluggish procedure. Thomas-Conrad's MCA adaptor topped out a 12Mbps; Olicom peaked at 8.8Mbps; and DCA made it to 4.4Mbps. On the ISA side, IBM's adaptor reached 9.5Mbps; Olicom, 8.2; Madge, 7.3Mbps; and DCA, 3Mbps.

Kevin Tolly is a director of the Data Comm Test Lab and President of InterLab. He is based in Sea Girt, New Jersey.

From the LAN$_d$ of Solutions

At LANNET we asked, "Can't we build a LAN where valuable information and computer resources can be shared, easily configured, convenient to implement – yet reliable for the most mission-critical applications?" We put our best minds to work and the result was the creation of our complete range of LAN connectivity products.

From the beginning we've been responsive to the demands of end-users and network managers of small, mid-sized and large local area networks for greater flexibility, reliability and manageability. Today we produce devices capable of supporting multiple protocols, various media types and different topological schemes. Its a new world of networking when you move into LANNET's LAN$_d$ of total solutions!

Dataplex

Melbourne:
Tel: (03) 210 3333 Fax: (03) 210 3399

Sydney:
Tel: (02) 349 3911 Fax: (02) 349 7747

TOREN PTY LTD
Member of the Ipex Group

Melbourne:
Tel: (03) 242 5050 Fax: (03) 242 5055

Sydney:
Tel: (02) 319 2755 Fax: (02) 699 8004

LANNET Data Communications
Intl. Headquarters:
Atidim Technological Park, Bldg. #3 Tel Aviv, ISRAEL.
Tel: 972-3-6458458 Fax: 972-3-5447146

LANNET
DATA COMMUNICATIONS LTD.

We Keep You Connected

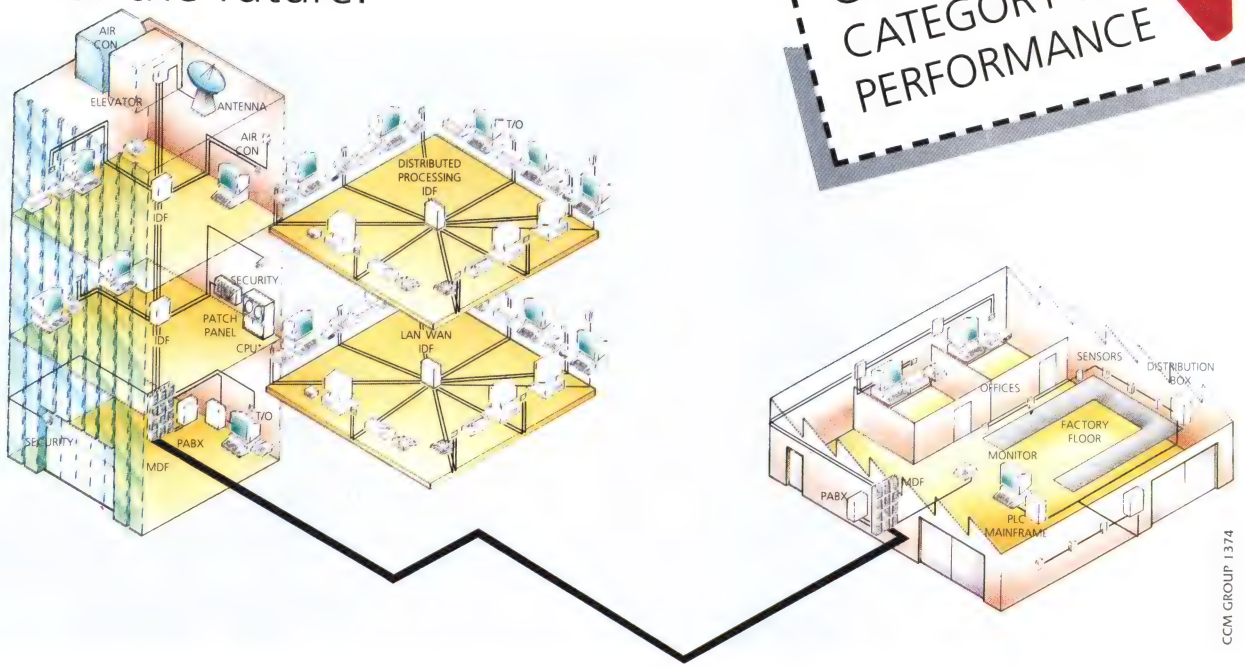
SYSTEM PLUS

K100

CATEGORY FIVE

You are now ready for the I.T. Networks of the future.

GENUINE 100MHz CATEGORY 5 PERFORMANCE



CCM GROUP 1374

Designed to Enhance Your Performance and Productivity.

A KRONE Cabling Solution has one aim;

To fit your network, giving it the flexibility to grow with your business, as well as with the constant changes in today's I.T. technology.

Rest assured, you'll have a more than capable, non-proprietary wiring system supporting your network.

A wiring system that's totally capable of handling 100MHz data traffic.

A system compliant solution that exceeds genuine Category 5 performance, comfortably.

A system that will provide the productivity you demand of your network.

The First Class Products and Support You Need.

KRONE's leading edge thinking has produced products designed to integrate with, and enhance, your system

The new 24 Port Patch Panel.

The SM-K Surface Mounted Outlet in both single and dual formats -

And the ground breaking KRONE LSA-PLUS PROFIL Module Mounting System.

A full complement of component supply assures you of the network support you need.

Complemented by an extensive local and international distribution network, your prompt supply is no problem.

And when it comes to installation, your KRONE Cabling Solution will have the added support of KRONE's network of First Class Installers and Suppliers.

Quality, You're Assured of.

A KRONE Cabling Solution, in fact every KRONE product, is Quality Accredited to the International Standard ISO9002 and AS3902.

Products that are developed, designed and manufactured in Australia.

So, you can breathe easy, knowing your network has the wiring system that will handle today's demand ... and breathe new life into it for tomorrow's challenges.

It's the wiring solution you can rely on.

Your right solution.

KRONE

KRONE (Australia) TECHNIQUE
PTY LIMITED ACN 002 047 181
P.O. Box 335 WYONG NSW 2259
Telephone: (043) 88 4422
Facsimile: (043) 88 4499
Help-Desk: (008) 801 298

KRONE IS A QUALITY ENDORSED AUSTRALIAN MANUFACTURER TO ASO3902/ISO9002

93/19

Building an Open, Standard Network

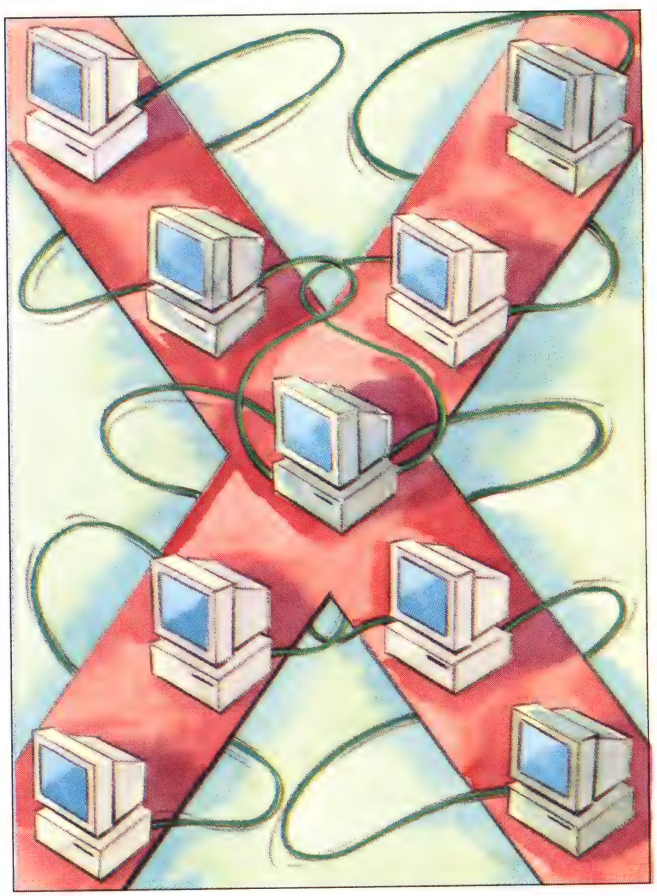
Vendors use the words with enthusiasm, but what exactly do 'open' and 'standard' mean when applied to LANs? Is it practical or even possible to build an open, standard local area network?

This article started as an answer to a question from one of my clients. Knowing full well that I have been preaching the use of — and strict adherence to — appropriate standards much longer than has been fashionable, my client neatly hoist me with my own petard. He asked me whether it was practical to build an *open* network system based completely on *real* standards. For some time now, the whole IT industry and network vendors in particular have been preaching the benefits of 'open systems' and 'standards.' Every vendor seems to have the ultimate in the latest bells and whistles. Furthermore, it's an *open* system so you can blow all the whistles and ring all the bells yourself. The open system is also standard so everyone else will be able to hear your bells and whistles. Great, but just what is 'open,' what is 'standard' and, assuming you can build an open system based on standards, why would you?

A strict definition of the term 'standard' is a definition of something published by an organisation like ISO, IEEE, CCITT, ANSI, etc. For reasons which will become obvious I am forced to adopt a more pragmatic, and in some ways conservative, definition. I find it useful to define a standard as a practical definition which is not under the actual or effective control of a proprietary interest. I consider a standard practical if mature implementations of that standard exist. Under this definition, the TCP/IP suite can be considered a practical set of standards although the Internet is not a standards body. On the other hand, the OSI protocols, which are unquestionably standards, are only just beginning to become practical and therefore in general I would choose TCP/IP over OSI at present.

My definition of 'open' is as pragmatic as my definition of 'standard.' I consider a system to be open if its manufacturer makes complete technical information and, where appropriate, tools available to end users, developers and competitors. These two definitions are not mutually exclusive, but they are interdependent. It is quite possible for a system to be open and non-standard or open and standard. It is not possible for a standard to be anything but open. For example, Microsoft's Windows is unquestionably open since it has made SDKs (software development kits), resource kits and numerous books available with no restriction other than purchase price. However, Windows is controlled by Microsoft and therefore is not a standard under the definition above. On the other hand, X Windows (a de facto industry standard to control the display of bit-mapped display devices) in its various forms satisfies both my definition of open and standard.

The desktop is the first place you will have to choose building blocks for your system. In most cases you are going to be looking for a GUI environment and your available choices will be Microsoft's Windows, Apple's Desktop and a variety of interfaces which I will simply refer to as 'X Windows.' While Apple's Desktop is a more mature product than Microsoft's Windows it fails my standard criteria for the same reason as Windows; it is controlled by a proprietary interest — Apple. The various X Windows implementations are, by the criteria given above, practical standards, they are more cost effective — that is, they give a better price/performance



For Networks, MPA has the Banyan Connection.

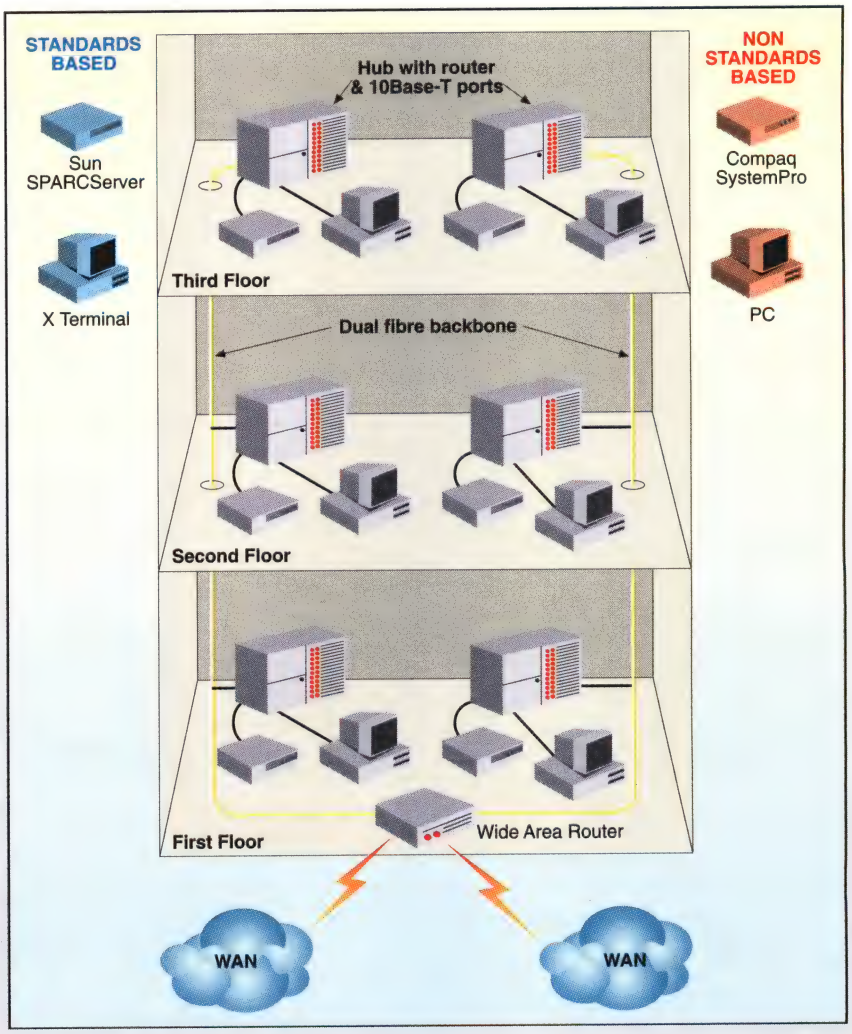
Banyan is the network system that has set the whole world talking. It's designed to begin small and grow easily, quickly and inexpensively. That's why Compaq have been using it since 1987. At one stage they were adding a server *every day* somewhere in the world. Now, with 11,300 network resources to look after, administration has to be simple and responsive. That's powerful. That's Banyan – networking without limits. MPA take an outstanding product, add outstanding technology, and deliver outstanding service.

SIMPLY OUTSTANDING TECHNOLOGY

MPA. 37-51 Lusher Road, Croydon 3136, Australia.
Melbourne (03) 724 4444, Sydney (02) 906 4499, Perth (09) 4811222, Brisbane (07) 832 4065, Canberra (06) 243 5119, N.Z. (9) 358 2888.

MPA 1377/BEATTY

Two Approaches to Building a LAN



Is it possible to put together a standards-based LAN? This figure illustrates two possible approaches to a typical networking scenario: The key on the left hand side identifies the most likely hardware found in a standards-based approach; the key on the right side identifies a common hardware configuration found in a usual, but non-standards-based approach.

The figure depicts a LAN (strictly speaking, an internet since it uses routers) which spans a multi-story building. Each floor of the building contains two 'workgroups' of 50 users each. Each workgroup has a single server/host. Server/hosts and desktop machines are connected to a hub which is capable of supporting a router which will route TCP/IP or IPX/SPX. Note that due to the choice of protocols/NOSs such hubs can be sourced from most major vendors in each case.

The LAN features a dual fibre backbone which connects directly to the routers. This configuration provides a degree of tolerance to cable damage, particularly if separate risers are to be used. The dual backbone is also easily converted to an FDDI ring should extra bandwidth be required in future. If this conversion is made only the router modules need be replaced. The only differences between the two LAN configurations are the server/hosts and the machines on the user's desktops.

The average corporate PC clone costs around $4,200 (excluding tax) including network adaptor and with DOS/Windows installed. Typically around $1,000 worth of applications are added to this. The recommended retail price of an Australian designed and built Labtam 300 X terminal is $5,590 ex tax. For an installation of this size, application software prices are still roughly double those for a PC — i.e. about $2,000 per user for something roughly equivalent to Microsoft Office. In both configurations each user is sitting in front of a mouse-enabled GUI on a 14 inch monitor with VGA resolution. The X terminals will draw less power and create less heat than the average PC. They will also run silently as they don't have fans.

The hosts in the standards-based approach are Sun SPARCserver 10 Model 41 systems (base unit includes 64 MBytes RAM and a 424 MByte hard disk — RRP $45,995) with Sun's File Server Option Pack (RRP $11,995). This option pack contains a 1.3 GByte hard disk, 5 GByte tape unit and a CD-ROM (Most Sun software is shipped on a CD). A further 64 MBytes of RAM would also be advisable to cope with this number of X terminals (RRP $13,985). The total RRP ex tax for the configuration is $71,975 per host. This brings the cost of the workgroup to $351,475 or about $7,030 per user at RRP ex tax. Note that in a 'real' network the CD-ROM and tape drive units might not be required on every server.

The servers depicted in the non-standards-based approach are Compaq SystemPro XLs (model 1020) with a 1 Gbyte drive array disk, 16 Mbytes of RAM and a Compaq DAT unit and controller (including cables and controller, RRP ex tax is $4,530). The RRP of the SystemPro is $25,895 ex tax. 50-user NetWare 3.11 is $8,275 RRP. Allowing $4,200 for each user's desktop PC the total cost of each workgroup is $248,700 or $4,974 per user.

These prices are RRP and, in the case of the PCs, an average of what my clients are currently paying, however it is the difference in the price per user which is of interest here. This figure is $2,056. Adding the cost of software the difference becomes about $3,000 per user. Obviously X terminals are not justified on price against an average clone PC but very few options are required to close that gap. More memory and disk space to handle a Windows swap file or anti-virus software (for example) could cut this figure by up to 50%. The costs associated with running personal computers 24 hours a day can further narrow the price difference. I doubt it will be too long before this price difference disappears.

ratio — than a Macintosh or a PC running Windows. Unfortunately they are more costly, in an average application, than the typical corporate clone, as is demonstrated by the rough costs in the accompanying example (See the sidebar 'Two Approaches to Building a LAN' above).

Where X Windows can be deployed cost effectively is in environments where 'odd' PC configurations would be required. For example, a PC in a dealing room might require three or four monitors and a special purpose video card to drive them. The same unit has to be highly reliable. A newspaper may require several Macintoshes with large screens for page layouts. A government department may have a requirement for high security, high performance workstations. In such cases an X terminal with one large screen may be a cost effective solution with a justifiable price tag if the network required to support them already exists.

An X terminal is a device which runs an X server, one or more protocol stacks and little else. An X server can be run on a DOS or Windows PC, a Macintosh or any form of workstation. The service provided by the X server is, put crudely, drawing shapes on the screen and relaying keystrokes, mouse movements, etc. to one or more clients.

In an X terminal, those clients are remote, though in other configurations (workstations for example) this need not be the case. Communication between an X server run on an X terminal and its clients is via a network and the protocol stacks in the X terminal and application hosts. The processing associated with your application happens on a host. Physically, this is exactly the

same as having a PC attached, via a network, to a server. The difference is that the server in a PC network need be little more than a very fast data store. Little use is made of the server's processing power. Given that the transmission system is the same in either case and provided the cost of the boxes you have to put on individual desktops to perform the functions required is similar; then in either case it is the cost of the central box, its software and its practicality which determines whether or not you choose an open, standard solution — i.e. X Windows — or a proprietary solution — i.e. a Mac Desktop or your favourite PC network operating system (NOS) and Windows. Make no mistake, *all* PC NOSs are proprietary. Since there is no standard PC operating system/environment there can be no standard PC NOS.

Realistically, the 'central box' in the X terminal example above will not be 'central' or singular. In a PC network you can attach a couple of hundred PCs to a network with two or three servers in some central location and the system will work. This is very poor design which will result in less than optimum system performance, but the system will be useable. In an X Window environment bad design simply will not work. X terminals generate large amounts of relatively small packets. If all of this traffic is going to just one or two hosts you will swamp those host's network adaptors. If your network is very large, or the bandwidth of your bridges and routers is relatively low, you risk swamping them too. That is why the manufacturers of bridges and routers give performance figures in terms of packets per second. To support an X environment properly you must implement a workgroup computing model.

Inventing the Workgroup

Contrary to popular marketing, the PC industry did not invent 'workgroup computing.' In EDP/MIS terms it is known as 'departmental processing' and it's been around since the late '70s at least. Whatever you chose to call it, the basic idea is that most of the processing requirements for a group of people be provided locally with respect to the group. This provides better response to members of the group and conserves backbone bandwidth without restricting access to remote resources.

There will always be DP tasks which cannot be economically performed locally. The classic EDP/MIS solution is to link departmental processors — 'workgroup platforms' in PC-speak — in a hierarchical system controlled by a process running beside the company's core systems on a mainframe in the head office basement. This is also known as SNA. There is actually no reason whatsoever for a hierarchical system topography. If a core system is required by a number of departments then you can either distribute it across the departmental platforms or run the system on a single host and provide it as a 'service' to the rest of the system. This is in fact the way the designers of SNMP intended that it be implemented.

The two approaches can be mixed easily. If you prefer to think in terms of PCs read 'workgroup' for 'department.' As the original idea emerged at a time when the standard desktop machine was a 'dumb' terminal it does not assume that each user will have exclusive use of a MFLOP-capable CPU. On the other hand, it does not assume that they won't either. As a result, the peer-to-peer PC environment, or the 'client-server computing solution' or even 'distributed processing platform,' and an X environment are valid implementations under the model.

Assuming that you now have or intend to build a network in which you distribute your servers then you have the option of using X Windows or a PC NOS. If you implement X Windows then you eliminate your dependence upon a single processor architecture. X terminals are available from several vendors who use CPUs from Intel, MIPS and others, along with products developed in-house — e.g. Digital, Hewlett-Packard etc. You also have the option of placing a completely expendable unit on a user's desktop with less impact on your server/host than a diskless PC. Unlike a PC with a disk, if there is a hardware fault you will never have to worry about reinstalling software. Your application software can also be run on a variety of platforms instead of being restricted to an Intel-based PC. Your workgroup platforms can be SPARC-servers, VAXes, HP9000 or Compaq SystemPros running SCO Unix, for example.

A Question of Protocol

Whether or not you choose a distributed computing model, the operating system(s) and applications you will have to run will be proprietary. Each vendor is in business to sell product. The only way to do so is to make a 'better' product than the opposition and to then sell the differences. If every word processor on the market had to have exactly the same features, price would be the only difference and the result would be that the company with the most cash could eliminate all opposition by starting a price war. Even a standard document format presents problems. Consider ASCII text as a 'standard' document format. How do you store bold or italic text? What good is it for writers who use mathematical characters?

Standards, by their very nature, are the lowest common denominator. They are a foundation; not a complete structure. As a result, all word processors support ASCII text, but nobody would dream of using it as a default format. You can choose applications which support standards, just as you can choose operating systems which support them. You can also develop applications in languages for which international standards exist. This will give you the greatest choice of platforms to run them on.

From a network perspective the most important standards which operating systems, and, to some extent, applications must support are protocol standards — which brings me to the TCP/IP vs OSI debate.

There are a couple of points which must be made about the emergence of OSI and the existence of TCP/IP. The first is that you will one day require an application which necessitates OSI. The second is that, like Unix and Fortran, TCP/IP will never die. The reason for the latter is that the TCP/IP suite is just too useful, too widely implemented in too many unique applications and has too many shareware implementations — especially on the Internet.

The TCP/IP suite is the Swiss Army knife of protocol suites, basically a simple idea which has grown over the years to support a range of useful gadgets. Unfortunately there are some gadgets which just can't be bolted on to the basic platform. An example is teleconferencing.

Teleconferencing requires the ability to transmit real time image data. To do this via a company network, which will be carrying all manner of other data, means transmitting 30 colour frames, of at least television quality, per second plus stereo sound. The bandwidth required is not the problem, delivering 30 frames per second *every* second is.

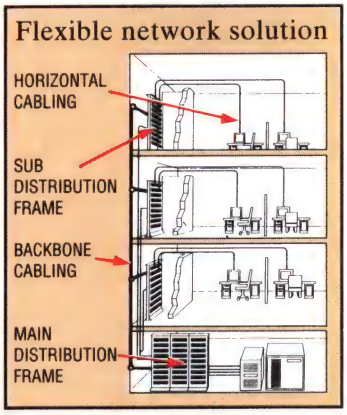
IP routers and MAC layer bridges have no way to distinguish the data associated with your teleconference from electronic mail or a file transfer, and since there is no way to identify a given type of traffic there is no way to give it any priority. The result is that you may get 30 frames for the first second, two the next and 47 the one after that. This would not be a problem if the data were, for example, a movie or a training video. All that would be required would be an enormous buffer at the receiving station to 'smooth' out the rate at which the frames were received. Such a buffer would effectively introduce a time lag. For a 'canned' video presentation this would simply be perceived as a delay between the user's request for display and delivery of the presentation. In a real-time teleconference this time lag would be very disconcerting to say the least.

The only way to eliminate this problem is to define a protocol which allows a distinction to be made between different forms of traffic and different data transmissions — i.e. my teleconference and yours, our teleconferences and their electronic mail — so that real-time data can be delivered at a fixed rate. This problem, known as *bandwidth reservation*, has been the subject of research for some time.

To allow for bandwidth reservation in a TCP/IP environment would mean rewriting IP, TCP and probably adding some third protocol. This in turn would mean rewriting large chunks of the TCP/IP Internet Pro-

From mainframe to mouse, MOD-TAP makes the connection.

Communications cabling is a subject we know better than anyone. In fact we invented the Integrated Communications Cabling System which has become the standard all around the world. We make the equipment and connect up the buildings and offices of the world's biggest corporations.



Vendor independent

Our strength is our freedom. We are the champions of Open Systems Integration architecture across our UTP, OSTP and Fibre Cabling platforms. Endorsed by more than 36 LAN and mainframe manufacturers, they suit any system including IBM, DEC, HP and all the big names.

Domino line

Architects love our range because of the variety of colours and styles. Engineers know it as the fully engineered, independently tested and most densely packaged modular system. Managers like its reliability, installers know it's well documented and easy to install.

The MOD-TAP solution

Look at the universal cabling platform shown here. LAN equipment can be introduced at any level using industry-standard patch cords – and *no* additional cabling products.

Made in Australia

Our presence in Australia has grown over five years – today we have our own manufacturing facilities and products, as well as a full inventory of the world's biggest range of cabling products. Call for our catalogue and talk to our systems specialists, before your next project.

MOD-TAP®

250 High Street, Melton 3337.
Telephone: (03) 747 8322. Facsimile: (03) 747 8627.

MOD 1432 BEATTY

tocol Suite. Those readers who have been following Alan Lloyd's *OSI Tutorial* column in these pages will be aware that OSI is being defined to take these sorts of problems into account.

Another reason you will have to deal with the OSI suite is that any protocol which is to be implemented on a commercial basis by the members of CCITT and other service providers must have some billing mechanism built in. The only way to 'charge' for TCP/IP network usage is by relating the charge to the bandwidth of the network link. The reason for this is that billing simply never occurred to the people who wrote the TCP/IP suite's standards. I believe that, if you want future wide area services, you will have to accept them in a form determined by the OSI protocols — if for no other reason than your telecommunications provider will find it easier to calculate your bill.

One of the major issues facing OSI's authors and the manufacturers of network products is ensuring that a relatively straight forward migration path exists from existing standards to OSI. This makes the would-be network builder's choice relatively simple as far as TCP/IP versus OSI is concerned. Buy TCP/IP today and you will be able to switch to OSI as useful products appear. You will have the best chance of trouble free integration, migration and the widest choice of products in the future if you stick to standards and open platforms today.

Transmission Hardware

Having discussed GUIs, applications, operating systems and protocols, the element to consider next is transmission hardware. The nice thing about networking at this level is that vendors make little other than standards-compliant products for the simple, and compelling reasons that they cannot sell products which do not comply and such products would be much more expensive to produce. If a hardware product is required by the market it must work with existing standards. As a result, it generally becomes a standard relatively quickly. An excellent example is Ethernet over twisted pair. Little product was sold until the 10Base-T — IEEE 802.3i — standard was adopted. Because there was such a demand for Ethernet over twisted pair 10Base-T went from draft to standard very quickly.

Where hardware is concerned the main problem for the would-be network builder is choosing between available standards. Fortunately most standards fall into basic categories by access type and by physical media. Access types are either synchronous or asynchronous. Examples of the former are ring topographies such as Token Ring and FDDI, while Ethernet in its various forms is the best example of the latter. In most cases synchronous topographies perform best when continuous transfer of large chunks of data is required between a fixed number of machines. Ring topologies, for example, were developed to interconnect hosts in a campus environment and they are still hard to beat in such situations. They have a stable, predictable, performance under load, allow basic management and fault isolation as well as providing high bandwidth. Asynchronous topologies such as Ethernet have been developed to handle terminals and a dynamic environment. Terminals generate large numbers of very small packets and the number active on a network at any time is completely arbitrary. Asynchronous access schemes also lend themselves to far more flexible bridging and routing schemes than synchronous access schemes.

Transmission Media

Media fall into three main physical types: Twisted pair, coax and fibre. Twisted pair is either shielded (STP) or unshielded (UTP). UTP is the cheapest on a per metre basis, however its distance is limited and in some cases you may have to install more of it. For example, 10Base-2 wiring to 100 workstations is likely to require less cable than wiring the same workstations with 10Base-T, since the former is a multi-drop topography. 10Base-T, being a single drop topography, will be more reliable and provides an easier platform to manage.

Twisted pair can also be implemented as a 'balanced line' in which a potential difference between two conductors is registered rather than a potential difference between a conductor and ground. This eliminates the sort of environmental problems which affect coaxial cable. For example, the potential difference between the base of a 10 story building and its top floor will be several times the signal level in a, for example, thick Ethernet cable. Unless the cable is grounded the data signal will be swamped. Even if the cable is grounded there is no guarantee that local ground potential will remain stable. Faulty or 'noisy' electrical equipment, lightening strikes, etc. can also lead to data loss.

Fibre, being non-conductive, eliminates all these problems. The cable is also cheaper than thick Ethernet, easier to deploy and can be deployed over longer distances. As a result, optical fibre standards such as 10Base-F-A/P/L and FOIRL are rapidly replacing copper in system backbones, many electrically hostile industrial environments and large networks where long hauls are required in spite of the relatively high cost of terminating fibre.

Another advantage of fibre is its bandwidth. The same fibre cable which provides 10Mbps bandwidth under 10Base-F can provide 100Mbps under FDDI. The limiting factor is the equipment at each end of the cable, not the optical pathway itself. The bandwidth of the optical pathway is limited by the laws of physics and for present cables that means in the gigabits/second range.

It is Possible

So in summary, it is possible, applications aside, to build an open standards-based network system. The practicality of doing so is determined by cost. The difference in cost between such a system and a largely proprietary one is proportional to how well your current system is planned and implemented. If your system has grown in an ad hoc fashion with more regard to the size of the capital expenditure request you have to hand the bean counter than to future expansion and reliability, then you will almost certainly find that the cost of implementing standards in the short term far beyond the scope of your budget. In the long term you will almost inevitably have to face this cost or risk becoming uncompetitive. Fortunately, you have the medium term in which to lay the foundations for your future.

If this is your situation you are not alone. Most PC-based networks have grown-up in just this fashion. Few, if any, companies with PC networks have given any thought to the future integration of voice, video and data on the desktop. Yet those same companies are actively investigating the implementation and/or upgrade of separate communications systems such as voice mail, telephone systems, fax, telex, electronic mail and in some cases video. They are also almost inevitably investigating the development and deployment of distributed systems and client-server applications.

The cost of deploying, managing and maintaining these systems separately will undoubtedly necessitate their integration. This process is already well under way with wide area voice and data links. Multimedia capabilities which are largely useless today will probably justify their existence tomorrow by replacing the telephone and voice mail once OSI standards are defined. As EDI becomes a practical and universal service you can expect to see it displace faxes, telexes and telegrams — assuming that the law keeps up with technology. Business will require these services in the not so distant future. In order to implement them at a realistic cost these services will be provided as an integrated system. In order to provide the platform for such integrated systems you must build a standards-based open system as soon as possible.

In the short term, by implementing such a system you increase the range of products available to you and reduce your dependence on any given vendor or manufacturer. You also get a more reliable, higher performance system and have the best chance of satisfying your users' needs which, after all, is the whole point of a computer network in the first place.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

Alloy's Networking Family

Providing Solutions To Fit All Your Networking Needs

MultiPeer

Peer to Peer LANs

MultiPeer is an MS-DOS based peer to peer network operating system.

MultiPeer provides full resource sharing for up to 255 workstations, configured as clients, servers or peers. It contains a built-in spooler for simultaneous printing, E-Mail for communications between users, and security features such as Password, Hidden and Read-only for all drives, directories, files and peripherals.

MultiPeer provides seamless NetWare connectivity, and supports any network interface card with an IPX/SPX driver (including Ethernet, ARCnet and Token Ring).

MultiPeer can be upgraded to **MultiNode** for terminal connectivity, multitasking and remote comm's.

MultiNode

Integrated Networks

MultiNode is an MS-DOS-based LAN combining **MultiPeer**'s peer-to-peer resource sharing and **386/MultiWare**'s multi-user DOS cost-effectiveness into one integrated network operating system.

MultiNode therefore enables up to 255 PCs to be connected as a peer-to-peer LAN. In addition, any 80386 or 80486 PCs can become **386/MultiWare** Hosts (called **MultiServers**) to support up to 20 users. These terminals can be local or remote, with multitasking capabilities and access to every hard drive, floppy drive and peripheral on the network.

Thus, **MultiNode** allows you to choose workstation types based on a particular user's requirements, not network limitations.

386/MultiWare

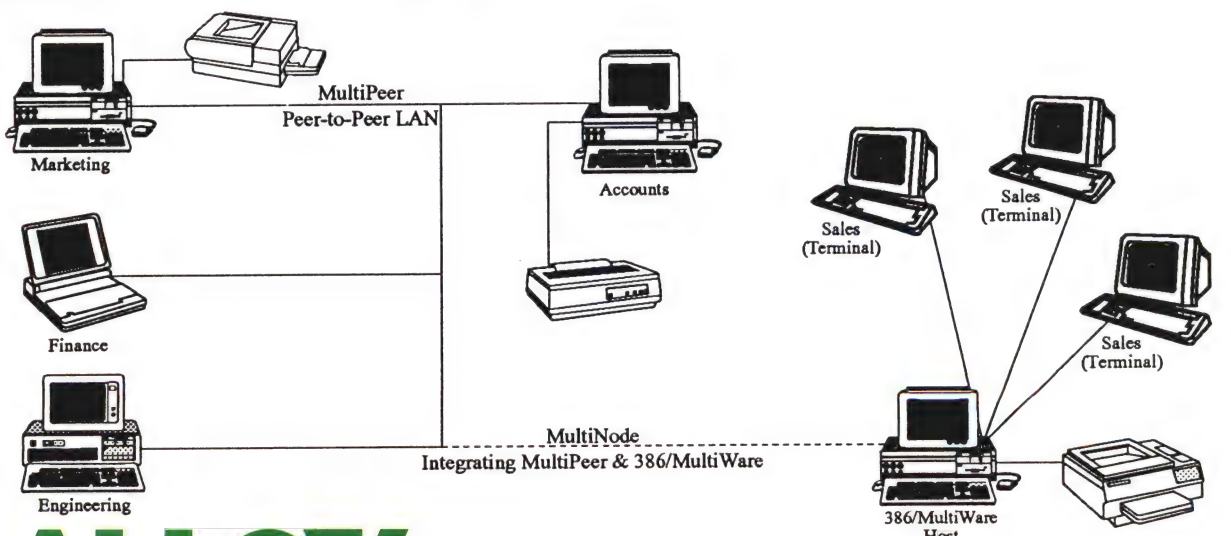
Multiuser DOS Networks

386/MultiWare is an MS-DOS based multi-user operating system.

386/MultiWare shares the CPU, memory and resources of an 80386 or 80486 Host PC with up to 20 users. It allows both locally and remotely connected terminals (or PCs emulating terminals) to multitask up to eight DOS sessions simultaneously, drastically increasing productivity.

Built-in Remote Communications allow users to dial in to the network and access resources as if locally connected.

386/MultiWare can be upgraded to **MultiNode** for PC workstation connectivity as your business expands.



ALLOY

A.C.N. 006 507 473
Alloy Computer Products (Australia) Pty. Ltd.
5 Enterprise Court, Mulgrave, Victoria, 3170
Postal Address: P.O. Box 15, Mulgrave, Victoria, 3170, Australia
Phone: 61 3 561 4988 Fax: 61 3 561 7412 BBS: 61 3 560 3902

MultiPeer Introductory Offer

Includes: MultiPeer Software, a 16 bit Novell Certified NE-2000 Compatible Network Interface Card, Terminators and a 3 m coax cable.

$319 per Node

These Routers Won't Let Your Network Down

No Single Point of Failure. Ensure that your network stays up, even if a single component fails, with extensive hardware and software redundancy, as well as fault isolation and recovery capabilities.

Unsurpassed Connectivity and Interoperability. Create one seamless internetwork with support for every major LAN and WAN medium and protocol, including SNA.

Industry-Leading Performance. Minimize application response times with forwarding performance that scales to 480,000 pps. Our unique symmetric multiprocessor architecture utilizes MC68040-based Fast Routing Engines and our 1 Gbps Parallel Packet Express.

On-line Operational Servicing (Hot Swap). Easily replace any hardware module without taking the router out of service.

On-line Dynamic Reconfiguration. Quickly change any configuration parameter without taking the router off-line or rebooting.

SNMP Node Management. Configure, monitor and control the router from a remote PC or workstation with our windows-based Site Manager. It's as easy as "point and click."

Network Security. Control access to networks, applications, servers and individual users easily and effectively using our Uniform Traffic Filters.

Investment Protection. Satisfy your growing network needs by adding software and hardware modules to our scalable systems, rather than buying new routers. Our commitment to standards ensures interoperability with other products, now and in the future.

Your company's success depends on how well your enterprise internetwork supports mission-critical applications. You need to keep your internetwork running all day, every day, no matter how much traffic it has to handle. Regardless of the number and type of protocols it has to support. Regardless of how often you have to make configuration changes. And regardless of unexpected malfunctions. That's why your internetwork needs the most technologically advanced routers ever developed – Wellfleet's Backbone Link and Concentrator Nodes. For more information and a free copy of Wellfleet's Router Evaluator, phone **David Barker today, on (02) 959 1290.** After all, you can't afford to choose a router that lets your network, or your company, down.

WELLFLEET Communications

When Your Networks Are Complex, Your Choice Is Simple.™

Come and see us at ATUG '93 Booth 501-B

Exploding the Myth of the Wired City

Despite the predictions of futurologists, new technology has so far failed to dramatically change the way we live and work. Tom Forester examines the reasons why the reality hasn't matched the hype.

On a recent visit to Adelaide, where the South Australian Government has the worthy intention of building a 'multi-function polis' (MFP) or 'city of the future' on a local swamp, I picked out the following from the publicity blurb: 'MFP Australia will be a communications pioneer, a wired city with broadband fibre optic cables linking all households and businesses, enabling residents to work at home through computer and telephone links.'

'Fibre optic terminals combining the functions of a telephone, computer, television, video recorder and camera will enable residents to pay bills electronically and to carry out regular chores such as shopping, lodging applications for licences and permits, banking and submitting tax returns from their own homes.'

'One commercial service will be an Information Utility . . . providing access through a wall-plug connection to a wide range of information which could initially include tourism, transport timetables, land information and general computing facilities.'

I'm sorry, MFP Australia, but I'm afraid I've heard it all before. I don't know how many times I've read the same tired cliches about the 'wired city,' the 'wired society,' the 'electronic cottage' and the 'global village.' Twenty years of such talk has produced few real advances — at least in the areas usually cited.

Home working has yet to become a significant phenomenon, and home shopping has flopped. Millions have been lost trying to interest the public in videotex information systems. If we are truly heading toward the Wired Society, we'll have to find some more promising applications than these.

An Old Idea

Delving into the history of the Wired City I found the idea has in fact been around for decades. In particular, the promotion of cable television in the US in the 1960s and 1970s generated many futuristic visions which saw economic and social benefits emerging from new communications networks. For example, James Martin's book *The Wired Society* talks about new 'electronic highways' that would deliver entertainment, medical and financial services directly to the consumer in their home.

Cable television was seen as the forerunner of this impending Wired Society. Experiments with interactive cable TV were launched in the 1970s in Japan (Tama New Town, Higashi-Ikoma), the US (for example, QUBE in Columbus, Ohio), in France (the Biarritz project), West Germany (BIGFON) and in the UK (Milton Keynes). The cable visionaries confidently forecast that within a few years large numbers of people would be working from home

and that banking, shopping and voting from home would become commonplace. Videotelephones would replace current models, and videoconferencing would replace much business travel. Electronic newspapers would complete the picture of life in the wired society.

A Brave New World?

The electronic cottage/wired city scenario was based on a number of different assumptions about the future development of society.

The proponents of the Wired Society believed that 'information' of all kinds would become increasingly important: consumers would demand more and more information as society became more complex and sophisticated, while the economy as a whole would become more reliant on 'knowledge workers' who would be in the business of producing, manipulating and distributing information. New information-based services would play a key role in international trade, whilst the actual production of information technology would become a major industry in itself.

Coupled with this belief in the importance of information per se was the claim that the new electronic technologies would have an educative and democratising impact on society. They would help decentralise power from the major purveyors of information, the mass media, and generally spread knowledge and enlightenment to the masses. Everybody would have equal access to the new 'electronic highway' system. As such developments were seen as practically inevitable, the smartest nations would be those that took advantage of the trends by rapidly developing the industries needed to produce the infrastructure of the Wired Society.

The Electronic Cottage

A recurring theme in the literature about the impact of computers on society is the idea that we will certainly see a large increase in the number of people working from home. For example, James Martin and Adrian Norman wrote: 'We may see a return to cottage industry, with the spinning wheel replaced by the computer terminal . . . The time will come when the computer terminal is a natural adjunct to daily living . . . It is possible, indeed, that in the future some companies may have almost no offices.'

Alvin Toffler, author of *The Third Wave*, gave us the concept of the 'electronic cottage.' He wrote: 'We are about to revolutionise our homes. The new mode of production makes possible a return to cottage industry on a new, higher, electronic basis, and with it a new emphasis on the home as a centre of society . . . The fight for the electronic cottage is part of a larger super-struggle between the Second Wave past and the Third Wave future.'

Jack Nilles carried out a famous study of the Los Angeles area following the 1973 oil price crisis, and produced some amazing statistics on the so-called 'telecoms-transportation trade-off.'

For example, he calculated that for every 1% of the US workforce who gave up urban commuting by car for telecommuting from home, the United States would save 5.4 million barrels of oil per year. If just 1 in 7 urban commuters were persuaded to drop out, America would have no need to import oil, traffic would be freed up and air pollution would diminish.

Every so often, some spoilsport would come along and point out that there was actually very little sign of the electronic cottage emerging, and assert that it was largely a myth. But soon after there would be a renewed flurry of interest — more often than not inspired by pro-telecommuting material supplied to the media by two New York-based commercial organisations, Link Resources and its subsidiary, Electronic Services Unlimited. Articles extolling the virtues of telecommuting continue to appear in the popular press.

Partly as a result of this publicity, the electronic cottage has become firmly established in the public consciousness as a widespread social trend. And the growth of a home-based workforce has been widely accepted as a given in discussions of the social impact of the IT revolution.

But the concept of the electronic cottage is still largely just that — a concept. There are comparatively few people working from home either on a full-time or part-time basis and of these, only a minority could be counted as 'telecommuters' or high-tech homeworkers who use IT equipment to process or transmit their intellectual products.

In the US, it is estimated only about 10% of the total US workforce work from home, and this figure will probably only grow to 15% by the end of the decade. But many of these people only work at home part-time, so it is not clear what proportion constitutes actual 'telecommuters.'

In Australia, an Australian Bureau of Statistics report in 1989 revealed that just 267,000 people out of a total workforce of 7.683 million work from home in either a first or second job. This amounts to around 3.5% of the total workforce. And of these, many are engaged in agriculture, manufacturing, construction, retail and transport: Only 112,000 are engaged in 'services' of any kind, so the number of telecommuters is likely to be considerably less than the 130,000 claimed by Telecom. Even if there were 77,000 people, this would amount to just 1% of the Australian workforce.

Many US corporations have experimented with telecommuting, but typically on a small-scale, and the experiments have usually been abandoned after a while. It is hard to find new examples of such schemes: time and again the same, well-publicised examples crop up in the literature — the Rank Xerox and FI schemes in Britain, and Blue Cross and Aetna Life in the US.

Why the Failure?

So why has working from home apparently not taken off? Basic problems like the fact that the vast majority of people live in small houses or flats which are quite unsuitable for homeworking are often overlooked by the proponents of telecommuting. A second, fundamental point usually glossed over in the literature is that there are not many occupations that can be performed at home. Economies of scale and the dynamics of centralisation in most corporate structures are rarely considered.

Most importantly, the literature seriously underestimates the psychological problems of working from home. As someone who actually worked at home full-time for seven years, it is my contention that an explanation of the failure of homeworking to take off might be sought in the area of human psychology.

It is very difficult — psychologically — to work from home. Homeworkers have to cope with many problems, including lack of motivation and discipline, inability to organise work and manage time effectively, loneliness, family tensions, fear of failure, burnout, stress and hypochondria. The success or failure of individual homeworkers is largely determined by their ability to cope with the stresses and strains imposed by this mode of work.

Homeworking Conflicts

The potential for family conflict has also been recognised as an important factor mitigating the growth of homeworking by a recent study carried out by the Department of Employment, Education and Training of 20 female homeworkers in Melbourne, which highlighted the conflict between domestic and money-earning duties.

A major United States study of work-family conflict involving 359 dual-career couples with children found a gender-specific impact among after-hours telecommuters who brought their 'electronic briefcase' home. Using an electronic briefcase enabled the men in the sample to work longer hours at home without an increase in work-family conflict. But for women, working longer hours at home meant high levels of stress arising from their dual role expectations.

It's pretty certain that in the future not many people will be in a position to work at home full-time, because of space constraints and the nature of their occupations. Of those who could work at home full-time, not many will choose to do so.

So we're unlikely to see the mass return home envisaged by the electronic cottage theorists. What we *are* likely to see is a small but steady increase in the number of people doing some, rather than all, of their work at home, as flexible working patterns become more widespread.

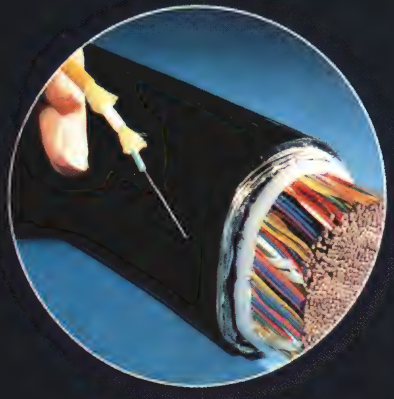
The new portability of much IT equipment means that more people are in a position to choose where they work — or at least where they carry out some of their work tasks. The electronic briefcase is freeing up work patterns — and ensuring that the 'new' professionals put in more hours at home.

Two other micro-trends should be noted. First, there are several neighbourhood telecommuting centre or 'telecottage' projects up and running in Europe and Australia (in

Metal Manufactures - World Class Communication Links for the Information Age

In the rapidly expanding telecommunications sector of the Pacific Rim, Metal Manufactures is a leading manufacturer of world-class optic fibre cable.

MM Cables - A leading manufacturer of superior quality optic fibre cable, operating from MM's new state-of-the-art facility in Clayton, Victoria.



Optical Waveguides Australia (50% MM owned)- A manufacturer of single and multi-mode fibres for use in telecommunication cables, data transmission systems, wideband networks, process control and cable TV.

MM Data Networks -A leading Australian distributor of Local Area Network equipment.

MM Cables Communication Products
Ph: (03) 544 1511

CABLES

OWA
Ph: (03) 795 7255

OWA

MM Data Networks
Ph: (02) 980 6922

Walcha, New South Wales and Cygnet, Tasmania). These enable teleworkers to get out of the house but stay in their locality. But it seems unlikely that telecottages will have a major impact on work trends.

Second, the advent of the co-operative workgroup software known as 'groupware' is expected by many in the IT industry to have a big effect on the way people and offices work. With the growth of computer networks, groupware will enable teams of people to work together on major projects without having to be assembled in the same physical location. Such remote working is an exciting possibility, but the chance of it having a major impact on working trends in the short term is equally remote.

Use of Electronic Media

If only relatively few people will work from home in the coming years, will more people stay at home and use IT-based gadgetry for entertainment purposes and to bank, shop and access videotex information services?

Certainly, the 200 million video recorders sold throughout the world cannot be ignored, nor can current sales of CD players, camcorders and other consumer electronics gadgetry. But on the whole the evidence is not encouraging for the Wired Society theorists and those who, only a few years ago, were predicting a home banking revolution or who were arguing that video games and PCs would open up a vast new market for home information services.

It has been estimated that only about 2% of US households use any kind of electronic information service. Britain's Prestel was a disaster, as was the West German Bildschirmtext. In Australia, Telecom has a long and unsuccessful history of trying to interest the public in using terminals to access information: The Computerphone, Viatel and Discovery all proved costly flops, never attracting more than about 20,000 users.

Commercial databases in the US like CompuServe and The Source have attracted users, but the only videotex service in the world to attract a mass audience is France's Minitel system, which boasts about 2.5 million terminals, or one in seven French telephone subscribers. But the Minitel terminals were supplied free by the French PTT, and most are used merely as electronic phone books. There are signs that the novelty of, for example, exchanging sexy messages on Minitel, is wearing thin.

Home banking has also failed to take off in the US and Europe. The most successful US experiments were the Bank of America's service in San Francisco, with 15,000 subscribers, and the Chemical Bank's Pronto service in New York, which claimed around 21,000 customers. The Verbraucher Bank in Hamburg, Germany, with 50,000 subscribers, was probably the most successful service in the world.

Even so, these figures are a far cry from the mass participation envisaged when the services were launched in the early 1980s. The Chemical Bank closed down Pronto in 1988. Several small-scale home banking experiments in the UK also went nowhere. There is some talk in Japan of home banking being relaunched using the millions of Nintendo and Sega video game consoles in Japanese living rooms, but for the present, home banking must be deemed a flop. The problem seems to lie with two basic drawbacks: it can't be used for cash transactions and most consumers don't do enough banking to justify the initial costs or recurring charges. Quite simply, it's not very useful and customers aren't demanding it.

Shopping Trends

Home shopping or teleshopping has also failed miserably. In the late 1970s, Warner-Amex showed that the concept was at least technically feasible with its famous QUBE cable television experiment in Columbus, Ohio. But since then a whole series of disasters have befallen the budding teleshopping-videotex industry in the US. In 1983, Time Incorporated wisely dropped its ambitious plans, but Knight-Ridder's Viewtron experiment in south Florida, Times-Mirror's Gateway service in Orange County, California and Centel's Keyfax service in Chicago all went ahead.

Many saw Viewtron as the pioneer of electronic publishing in the US, and it was heavily promoted. Users could shop, bank, catch up with the news and access commercial databases from home. But Knight-Ridder only managed to sign up a claimed 5,000 customers in the first year, and Viewtron was shut down in 1986 after losing an astonishing $US55 million. Smaller-scale experiments in the UK went the same way.

Shopping from home has failed because of practical problems such as complicated onscreen instructions, difficulties over payment systems, problems with arranging delivery times and a restricted choice of products. But more fundamentally, it may have failed simply because it does not meet the psychological needs of shoppers: many people enjoy shopping, especially its social aspect. A shopping expedition offers people the chance to get out of the house, with the possibility of bumping into friends and reacquainting themselves with their local community.

In their magisterial study, *Wired Cities,* Dutton, Blumler and Kraemer state: 'The new electronic media have not yet become as centrally important for individuals, businesses or communities as the proponents of wired cities expect they will.'

In the same volume, J.L. King, after reviewing all the available evidence, concluded, inter alia, that:

- Initial estimates of the diffusion of wired city innovations were too optimistic;
- Information services have proved less attractive to consumers than cable TV;
- Most viewers are not interested in two-way interactive TV; and
- Wired city experiments have proved inconclusive both in respect of identifying new markets and in promoting broader social goals.

King had to conclude that: 'The experiments tell us that wired cities have not made a major impact as yet in the overall scheme of things.'

In a similar way, the promoters of 'home informatics' appear to have overestimated the capacity of IT-based gadgetry to transform domestic lifestyles. The argument that developments in consumer electronics, computers and telecoms will dramatically alter the nature of economic and social activity in the home is simply not supported by the available evidence.

Despite the fairly recent arrival of microwaves, video recorders, CD players, big-screen TVs, answering machines, home fax machines, word processors and portable phones, life goes on in much the same way for the vast majority of people. A succession of revolutionary 'homes of the future' incorporating various 'home automation' systems have been built in the US and Europe in recent decades, but by and large they have left consumers cold.

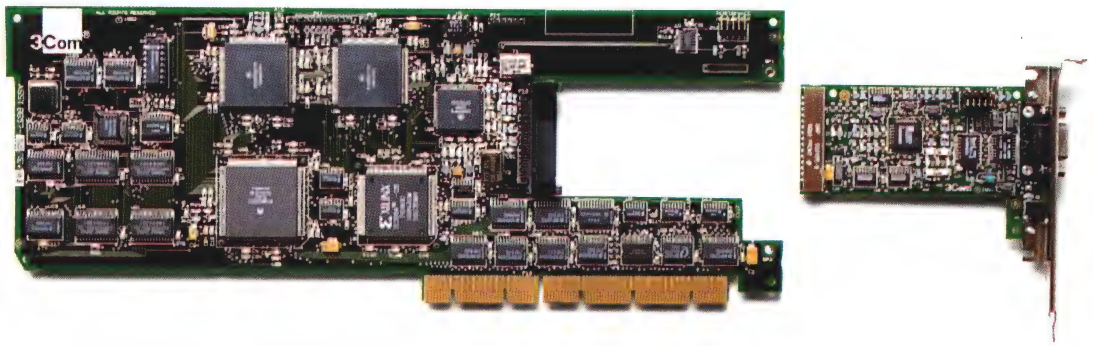
New developments such as home movie theatres may tempt some people to stay in their homes for more of the time, but as banks, retail shops, restaurants and cinemas upgrade their facilities in order to attract customers onto their premises, as developers put up more 'smart' office buildings in CBDs in order to accommodate high-tech office workers who could be telecommuting, and as local authorities promote landscaped office parks as ideal work environments, there seem to be just as many countervailing trends which will serve to attract people out of their homes.

The Wired City Revisited

Despite all this, recent developments in fibre optics, the digitisation of telecommunications, ISDN and the proposed construction of new 'data super highways' featuring broadband optical fibre cable into every home and business have once again put the Wired City back on the public policy agenda in the 1990s.

Optical fibre is undoubtedly a very significant innovation and ISDN will be a major step forward in communications. But because so many sophisticated private networks have come into existence in the past few years, some are now suggesting that ISDN may no longer be necessary. It is said that large corporate customers have already satisfied their communication needs and low-level users such as residential subscribers do not really need any of the new ISDN services.

Think of this as the match that lit the fuse that started the FDDI revolution.



FDDILink's unique "PMD" module design makes changing media a snap.

Every revolution has its moment of truth. For FDDI, that moment is now.

Introducing 3Com's FDDILink™ family of 32-bit EISA adapters. They bring blistering FDDI performance to your network for as little as $2,500. That's up to half the cost of comparable adapters.

And that's not all. Backed by a lifetime warranty, the FDDILink family gives you the flexibility to ease your network into FDDI, at your own pace. Thanks to their unique "PMD" module design, FDDILink adapters can be used with shielded twisted-pair cable or fiber-optic cable. And even with unshielded twisted-pair when standards are finally approved. Simply plug in the appropriate media module.

Now you can let the high-powered hardware and software on your network perform at its full potential. That's because FDDILink can deliver 100 Mbps performance to the desktop using lower-cost shielded twisted-pair copper cable and connectors.

And what's even better, when you add 3Com's NETBuilder® II Routers and LinkBuilder® 3GH Hubs, you have a total solution that runs all the way from the desktop to the WAN.

But that's enough talk. For FDDI revolutionaries, this is a time for action. Call **(02) 959 3020, ext. 22**, or contact your nearest 3Com distributor.

3Com®

Networks That Go the Distance™

Tech Pacific Australia
(02) 697 8666

Tech Pacific New Zealand
(09) 415 8300

MM Data Networks Australia
(02) 980 6922

BICC Communications New Zealand
(09) 358 0322

i.t. connXions Australia
(02) 415 0555

From this perspective, the abbreviation ISDN has come to stand for 'Innovation Subscribers Don't Need.' Many commonly used applications, such as electronic mail, small file transfer and even graphics transmission will be no better served by ISDN, and are already quite adequately catered for on the existing network. Critics like the US-based Electronic Frontier Foundation also claim that too much has been spent on ISDN marketing hype by major suppliers, who are simply interested in selling more telecoms gear.

Even though ISDN will not be fully implemented in most countries for some years and even though there are serious questions being asked about its usefulness, Wired Society visionaries are already talking about the post-ISDN era when every household, business, school and hospital is wired-up with broadband fibre optic cable.

The Japanese Government has plans to wire up the whole of Japan by the year 2015 — the so-called 'Hypernetwork' — whilst the US Government is being urged by some academics and politicians to start building a 'National Information Infrastructure' or an 'Information Super Highway.' In Europe, born-again Wired Society buffs are calling upon the EC to construct what they call a 'European Nervous System.' Of course, all the usual arguments about 'falling behind' and 'keeping up with the international competition' apply. The main problem with these plans is that nobody seems to know what we will actually use the new network for: tired old examples like home shopping and home banking are cited — with the sole new addition being the downloading of videos from the video store!

One particularly shrewd telecoms analyst, former AT&T marketing executive and now university professor, A. Michael Noll, has referred to this latest wave of Wired Society mania as the 'Broadbandwagon.' Noll points out that the main driving force for new networks is technological — that is, this particular social revolution is supposed to result from technology-push rather than consumer demand-pull.

This is always a worrying sign, especially when proponents of the new networks are so ignorant of recent history and are hard pressed to come up with any new applications which can't be accommodated on the existing phone and cable TV networks. Noll says that neither the market, the technology or the consumer is ready for broadband to the home, and nothing rapid is likely to happen in this area: 'A wise strategy would be to remain on the sidelines and let the broadbandwagon pass by.'

Based on False Assumptions

Despite that fact that the concept of the Wired City has been around so long know it is almost written in stone, in truth it is based on false assumptions about the role of information and communications in society — and especially about fundamental human communication needs.

One of the major activities envisaged in the Wired City — working from home in the 'electronic cottage' — has not taken off for many social-psychological reasons, and is simply not a significant phenomenon.

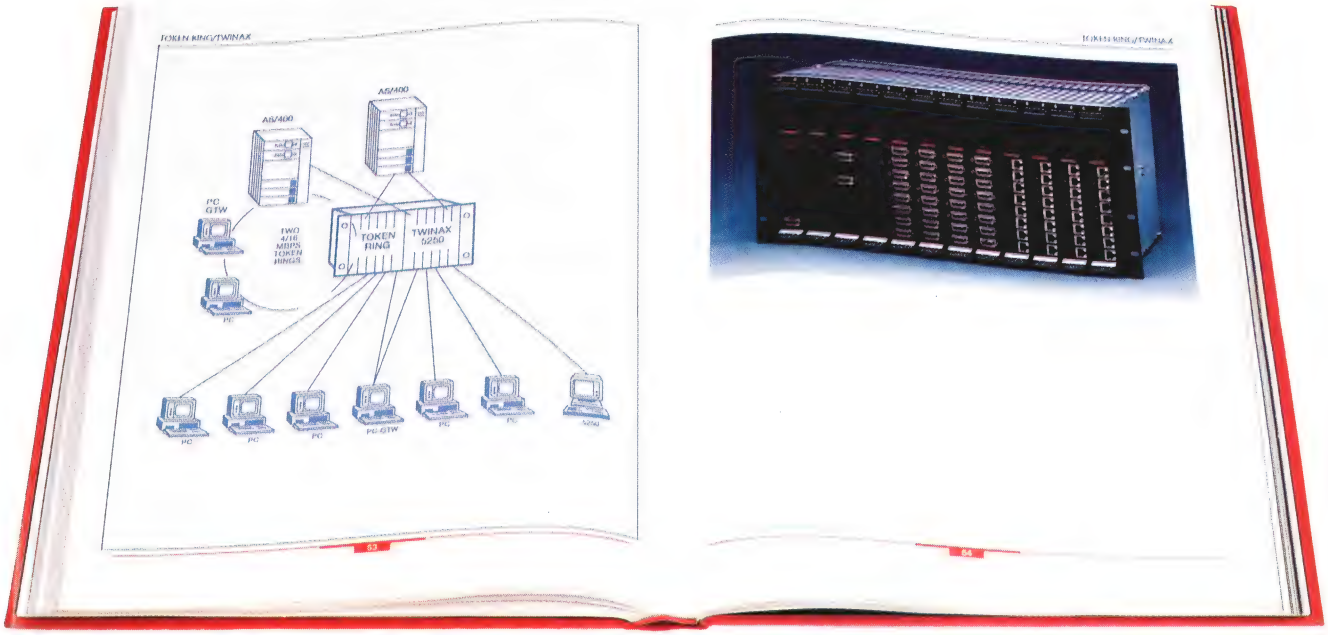
Despite numerous attempts to spark interest among the general public, the use of electronic media for activities like information retrieval, home banking, home shopping, voting from home, on so on has been consistently disappointing.

And recent attempts to revive the Wired City by pointing to technological developments such as ISDN, computer networks and broadband optical fibre cable will not really do much to change this lack of public enthusiasm.

Tom Forester is Senior Lecturer in the School of Computing and Information Technology at Griffith University, Brisbane, and the author/editor of six books on information technology.

SEE US AT ATUG '93
Stand #540

The book on hub applications has just been rewritten.



Introducing SpiderNet. The first smart hub that can be shared by AS/400 and Token Ring.

In the past, only LANs could enjoy the advantages of intelligent hubs.

Today, there's SpiderNet, a multi-media wiring concentrator, bringing increased intelligence and flexibility to IBM midrange networks.

Managing your AS/400 or S/3X network has never been easier. SpiderNet's fault tolerant platform detects and isolates cabling and hardware troubles without disrupting other devices. All enclosures and modules down to the port level can be managed by SpiderNet NMS Network Manager.

SpiderNet supports a variety of twinaxial multiplexer and active star modules. Equipped with two twinax buses, it connects to two local or remote S/3X or AS/400 systems simultaneously.

SpiderNet follows AS/400 and S/3X protocols. Its protocol transparent operation is compatible with a broad range of networking application software, including SNMP and NetView.

In addition, you can connect multiple Token Ring stations to the same AS/400 as your twinax devices via SpiderNet in a structured star topology. This duality lets you use SpiderNet as a twinax hub serving up to 70 twinax stations, a Token Ring hub serving up to 192 Token Ring stations or a hub serving twinax and Token Ring networks at the same time.

For more information on how to concentrate your midrange network and become more efficient and productive than ever, call Dataplex.

Melbourne (03) 210 3333
Sydney (02) 349 3911
A.C.T. (06) 285 3657
N.Z. 9 307 8139

Ask how you can get a free copy of our Planning Guide and Wiring Solutions for S/3X and AS/400 Systems.

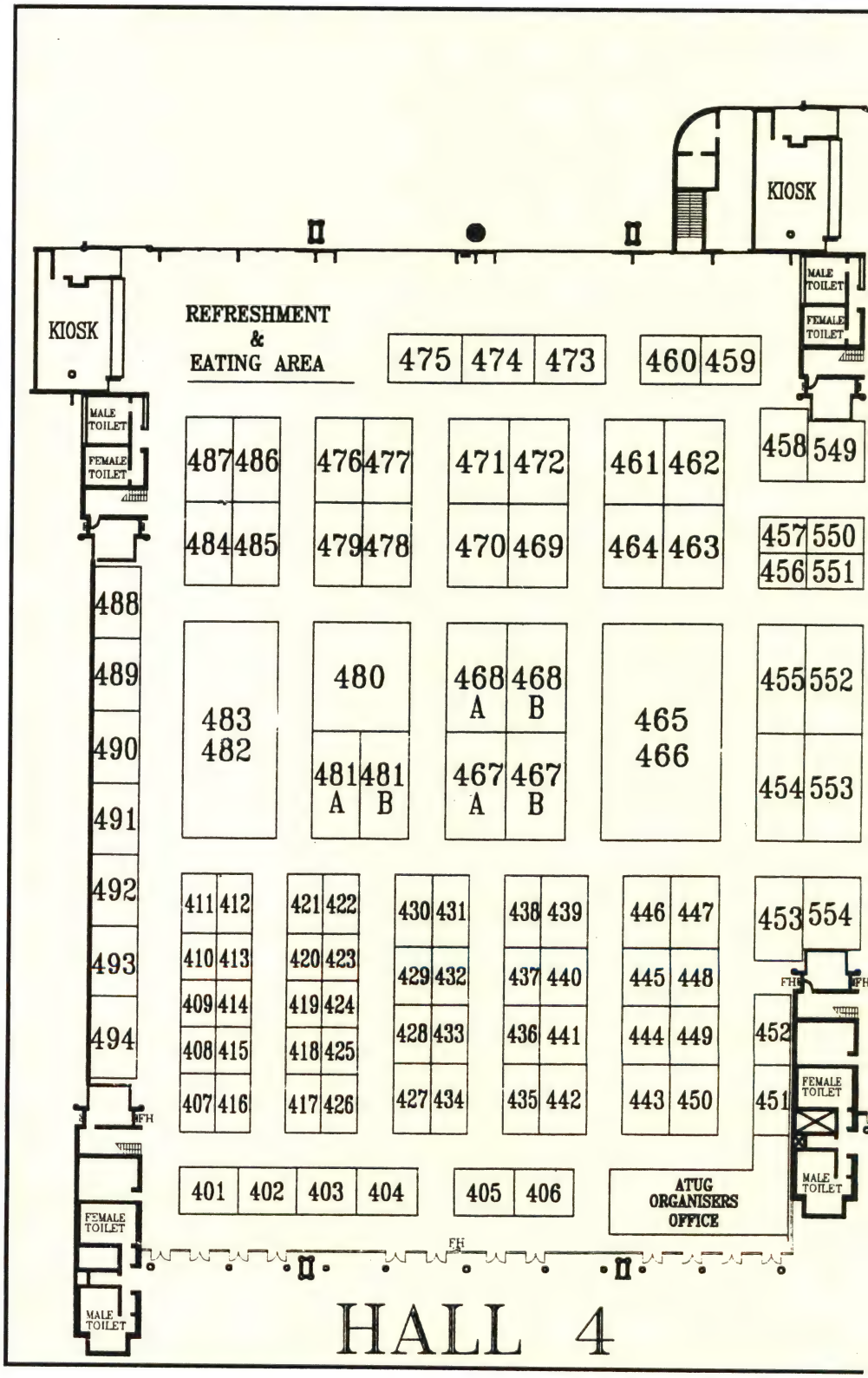
Dataplex

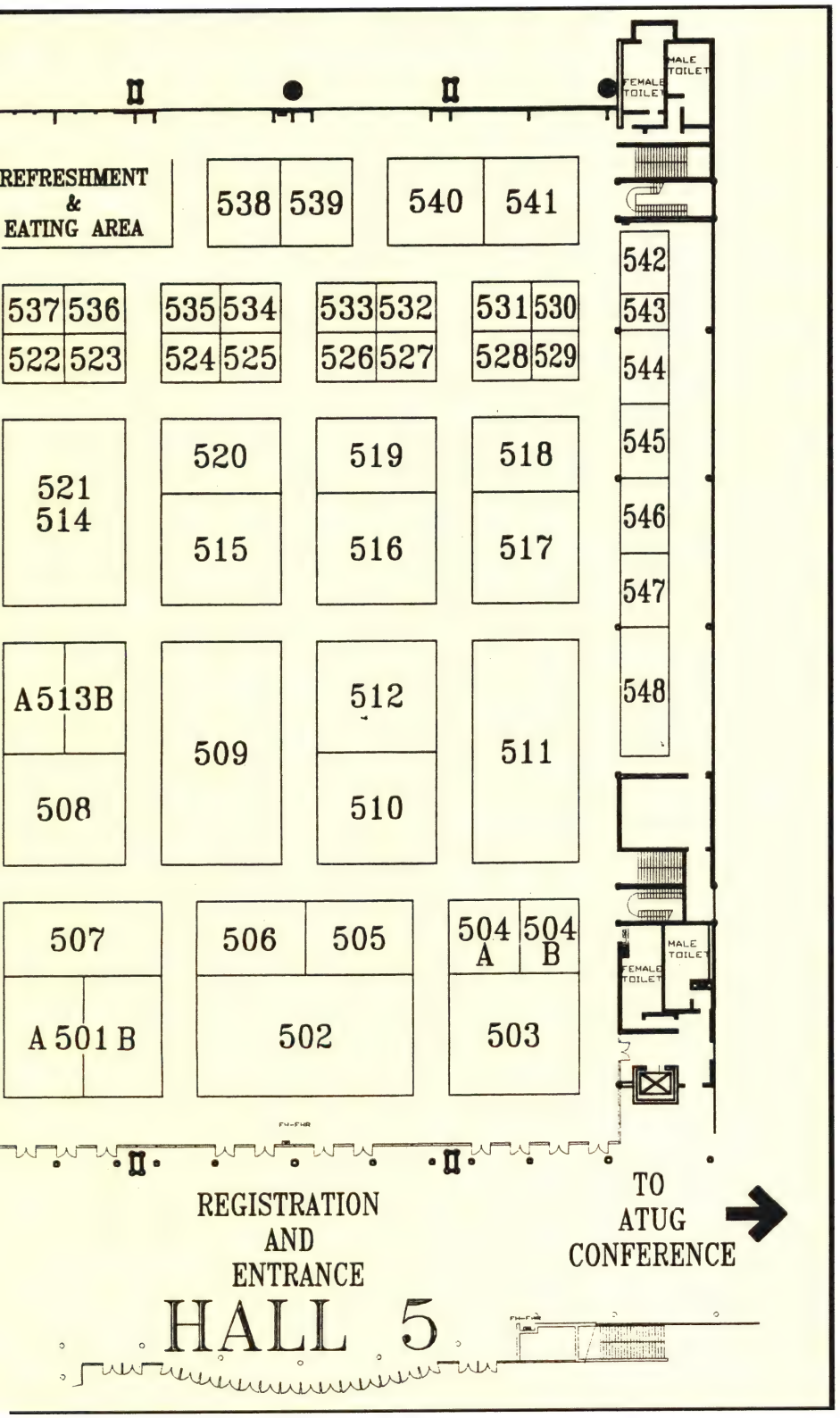
ADACOM COMMUNICATIONS

DATA COMMUNICATIONS NETWORKS AND EQUIPMENT

ATUG'93 AT A GLANCE

EXHIBITOR	STAND NO.
3M Australia Pty Ltd	530
AAP Telecommunications	512
AC&E Sales Pty Ltd	535
Active Voice Corporation	416
ADC Telecommunications Inc	481B
ADE Network Technology	524
Advanced Compression Technology	537
AEGIS Pty Ltd	460
A G Garland & Co Pty Ltd	412
Alcatel Australia Ltd	519
Allied-IFS Pty Ltd	486
allNET Technologies	462
Andrew Australia	434
Anixter Australia Pty Ltd	476/477
Ascom Tele-Nova Pty Ltd	553
AT&T Australia Ltd	463/464
ATUG	456
Australian AMP	429
Australian Communications	550/551
Australian Tel-Tec Pty Ltd	528
AWA Communications	506
Banksia Information Technology Pty Ltd	474
Black Box Catalog Australia Pty Ltd	423
Cabletron Systems Pty Ltd	461
Call Processing Systems	475
Canadian Consulate General	426
Canon Australia	518
Cisco Systems Australia Pty Ltd	505
Cohpac Communications Systems Pty Ltd	452
Comnetworks Pty Ltd	479
Dataplex Pty Ltd	540
Datapoint Corporation	491
Dialogic (NZ) Ltd	415
Electroboard Pty Ltd	546/547
Electro Optics Pty Ltd	410
Ericsson Australia Pty Ltd	502
Exicom Communications Systems	480
Fujitsu Australia Ltd	514/521
GEC Plessey Telecommunications	520
GN Elmi Australia Pty Ltd	554
Hardie Networks	468B
Hawker Batteries	467A
Hewlett-Packard Australia Ltd	458
Honeywell Network Systems	487
INC Manufacturing Pty Ltd	472
Infolink Group Ltd	440
Infonet Australia	529
Information Network Solutions	522
Infotron Systems Pty Ltd	453
Instalcomm Engineering Pty Ltd	534
Intercel Pty Ltd	536
Interquartz (Australasia) Pty Ltd	552
JN Almgren Pty Ltd	469/470
Jtec Pty Ltd	517
Kingfisher International Pty Ltd	439
Kooka Konnections	443
Krone Technique Pty Ltd	538
KWA Operations Pty Ltd	406
Lancon Pty Ltd	459
Link Telecommunications	531
Madison Technologies	468A
Marconi Instruments Pty Ltd	457
Maser Technology Group	438
MCI International Australia	510
Miller Professional Products	425
MM Cables — Communications	471
Mod-Tap (Australia) Pty Ltd	473
Motorola Australia Pty Ltd	515
MPA Australia	421/422
NEC Australia	509
Nira Australia	455
Nokia Telecommunications	503
NorTel Australia Pty Ltd	508
North Supply Communications	408
Olex Cables	442
Open Access	432
Optelcom Pty Ltd	441
Optical Cable Corporation	525
Optus Communications	511
Pacific Computer Weekly	542
Panasonic Australia Pty Ltd	467B
Philips Scientific and Industrial Pty Ltd	411
Phoneware Communications Systems	450
Prentice Hall of Australia Pty Ltd	409
Proteon Inc	539
Q-Net Australia Pty Ltd	488
RAM Communications	437
Reed Business Publishing Pty Ltd	413
L & B Rittal	532/533
Rohde & Schwarz (Australia) Pty Ltd	414
Rosser Communications	527
Scitec Communications Systems	516
SHC Cable and Connector	549
Skilled Communications	446
Smart Accessories Pty Ltd	526
Stratus Computer Pty Ltd	490
Sun Microsystems Australia Pty Ltd	405
SVT Video Systems Pty Ltd	430/431
SwitchView	418
Synoptics Communications Inc	507
System Solutions Pty Ltd	419
Techmetal Industries Pty Ltd	451





No matter what your telecommunications needs, you must look at the bottom line.

No matter what type or size of business you are in, the options offered by the telecommunications industry can work to make it more efficient, effective and profitable.

But with options come questions. Questions that can only be answered at ATUG '93. The complete showcase of what's new and what's happening in telecommunications from hundreds of different suppliers.

It makes ATUG '93 the only way to make the right decisions, choose the right options and connect with the right suppliers. Make it your business to be there.

For conference details and registration, call **(02) 965 4243.**

10th Australian Telecommunications Exhibition & Conference.
Darling Harbour, Sydney, Australia.
May 11-13 1993.
Open 9am-6pm Daily.

RIDDELL EXHIBITION PROMOTIONS PTY LTD

FREE ADMISSION TO BUSINESS PEOPLE

Riddell House 135-141 Burnley St. Richmond. 3121.
On behalf of the Australian Telecommunications Users Group.

Avoid queues. Fax this form before 23/4/93 to preregister.
Your admission Badge will be mailed to you.
Riddell Exhibition Promotions. Fax Melb (03) 427 0829 Syd (02) 550 4345

COMPETITION IN ACTION

People under the age of 18 years not admitted.

Name _____

Company _____

Industry _____ Title _____

Address _____

_____ P/Code _____

Phone: (____) _____ Fax (____) _____

ATUG '93

10th Australian Telecommunications Exhibition & Conference

MF/1642/REP

LANtastic 5.0

Artisoft has released version 5.0 of its best-selling peer-to-peer network operating system. New features in version 5.0 include multi-platform connectivity for corporate workgroups, and enhanced network administration, security and printing. Additionally, a new LANtastic for Windows scrapbook feature facilitates the exchange of graphics, text, and audio information across the network.

The new version can now support up to 500 users per server, and users can now bridge to OS/2, HPFS, WORM and other non-DOS drives. Version 5.0 also has bridging capabilities to Unix NFS, allowing a LANtastic server that is also a Unix client to serve as a bridge to the rest of the LANtastic network.

It also allows the administrator to set up all user accounts on a single server, and a remote server management feature lets users control the server without leaving their desks.

Additional security features include ACL groups, which let multiple users, such as workgroups within a department, to have the same privileges regarding particular files on servers. Users can individually be assigned access rights on top of those linked to the ACL group.

Further enhancements include improved caching abilities, an 'auto retry on disconnect' feature that will automatically attempt to re-establish a broken server connection, better printing including delayed spooling, support for COM3 and COM4, and remote despooling, which lets a server's print queue be serviced by remote printers.

Also released from Artisoft is a new kit that provides LANtastic users with connectivity to other operating environments. The NDIS Support for LANtastic Kit lets users load or stack multiple protocols, giving transparent access across platforms such as Unix, NetWare and IBM mainframes. Protocols can be loaded and accessed concurrently without interrupting the LANtastic network connection.

Artisoft (02) 880 2688

LANtastic Version 5.0 offers better security, printing and management

Category 5 Cabling

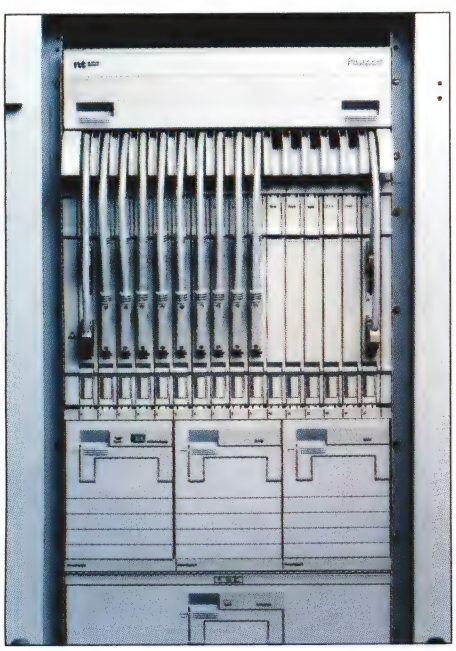
Krone has announced the release of its K100 family of cabling products in Australia. The new product range is fully compliant with EIA/TIA Category 5 performance requirements, and Krone says the system sets the standard for running 100Mbps traffic over UTP wiring.

The K100 product range encompasses a range of physical cabling accessories associated with patch panels and data outlet boxes. Within each wall-mounted data outlet there are four pairs of unshielded twisted pair cable, which is compliant with Category 5 specifications.

Company officials claim that the K100 family will help ensure that structured cabling sites will be in the best position to take advantage of high speed data, voice and videoconferencing applications in the future.

Krone (043) 88 4422

NorTel's Passport Combines Frame and Cell Switching



NorTel's Passport enterprise networking switch will commence field trials later this year

Expected to be available early next year, Passport, Northern Telecom's new 'enterprise networking switch' will combine LAN routing and bridging with voice and image networking.

Based on ATM architecture, company officials said the device incorporates both frame and cell switching, and features unique traffic management capabilities and a frame-to-cell conversion ability. The first cell-based product in Northern Telecom's Magellan product line (which includes the DPN-100 switch), Passport has an aggregate capacity of 1.6Gbps in a single shelf configuration, they said. Two shelves, each containing 16 card slots, can be mounted in a 6 foot cabinet or 19 inch rack. The RISC-based cards will be hot-swappable and mounted on a dual load-sharing bus.

The product will support FDDI, Ethernet and Token Ring LAN interfaces; X.25, SNA and frame relay wide area protocols; and international standards for user access at speeds up to 2Mbps and trunking at speeds up to 45Mbps. Company officials say all popular routed protocols will be supported and the product will fully support SNMP.

NorTel (02) 428 8777

Frame Relay

Datacraft has announced the release of nine new frame relay products from US vendor Telematics. The product line, known as NETFrameXchange (NFX), ranges from a low-cost customer premise access node to a high end fully redundant backbone model capable of handling up to 150,000 frames per second.

Three backbone models, the NFX7100, NFX7300 and the NFX7500, will provide switching capacities from 30,000 up to 150,000 switched frames per second, with connectivity ranging from 24 to 224 T1/E1 ports. The backbone models use a customised three-chip set switching architecture and RISC technology to provide a complete frame switch on a single board.

Multiple boards, called the frame switch models, are used to extend the products' switching performance from 10,000 switched frames per second up to a maximum of 150,000 switched frames per second.

New network service software developed specifically for frame relay transport supports ANSI and CCITT User-to-Net-

Xtree Tools combines seven modules under a common interface

Xtree Tools Bolsters NetWare Performance

Xtree Tools for Networks, Novell Edition, Xtree's package of seven LAN management modules all sharing a common interface has been released in Australia. Priced at $1,065 for the first server and $630 for each additional server, the product is designed to provide proactive solutions for a wide range of common network management tasks and problems, according to company officials.

The seven modules are: Configuration Manager, Server Monitor, Workstation Monitor, Configuration Backup and Restore, Quickstat, WatchLAN and NetTrack.

Configuration Manager effectively replaces the NetWare SYSCON utility and allows managers to change and document file server information. It displays all information on one screen and contains features not found in SYSCON, such as Supervisor Equivalents, which displays all users with supervisor privileges and displays them in one window. Server Monitor provides standard FCONSOLE functionality and incorporates command capabilities associated with NetWare's RCONSOLE. Workstation Monitor displays information about network workstations. It provides managers with the ability to analyse and control workstation performance from a single location. Configuration Backup and Restore allows managers to quickly save and restore NetWare bindery and other information, while Quickstat provides over 100 network performance tests. WatchLAN is a runtime testing and event notification module which allows managers to set network performance thresholds and interpret results from NetTrack, which collects file server statistics.

Tech Pacific (02) 697 8666

work Interfaces, in addition to a backbone inter-nodal protocol that delivers Telematics' Fairway bandwidth management functionality. Datacraft says Fairway uses a sophisticated frame relay CIR, congestion and bandwidth management algorithm that ensures a fair allocation of network resources, even during periods of heavy traffic on the backbone.

The Telematics frame relay software has an architecture designed to support the emerging SVC services and, as well, provides a call processing module and a dynamic routing information base. Officials say this allows the network manager to have frame relay virtual circuits allocated dynamically by the networks on a least-cost best-available path, or for implicit routes to be defined.

The two adaption products, the NFX400 and NFX500, can adapt a range of protocols, including frame relay, into a frame relay public or private network service. Company officials said the NFX400 and 500 adaption layer platforms can utilise both leased lines and potential public frame relay services simultaneously to provide a fully-meshed network infrastructure.

The protocol support on the current range of Telematics packet switching products is continued over the NFX platforms. Four models, the NF10, NF20, NF30 and NF40 support a wide range of common protocols including frame relay, X.25, SNA, Async, BSC, and TCP/IP.

Datacraft (03) 727 9111

Token Ring Adaptor

Andrew Australia has announced the release of a new ISA Token Ring adaptor which the company says offers users improved throughput, simplified software configuration and better diagnostics.

Priced from around $900, up to eight of the new Master Series ISA IIA Token Ring adaptors can be installed in a 486-based file server. Based on a Texas Instruments chip set and Andrew's own ASIC design, the adaptor supports STP and UTP wiring and is software configurable via the Andrew Token Ring Adaptor Card Test (ATRACT) program. It also offers full diagnostic test capability and on-board LEDs for status monitoring.

Andrew Australia
(03) 357 9111

RAD Repeater

RAD Data Communications has announced its TLR-16 Token Ring Lobe Repeater, which allows connectivity over any type of cabling.

The TLR-16 operates at 16 or 4Mbps, and features signal conditioning using reclocking, reshaping and regeneration of the signal and jitter attenuation. The unit complies with IEEE 802.5, and extends the distance between the access unit and the workstation. Different models are available for UTP, STP, fibre optic and coax.

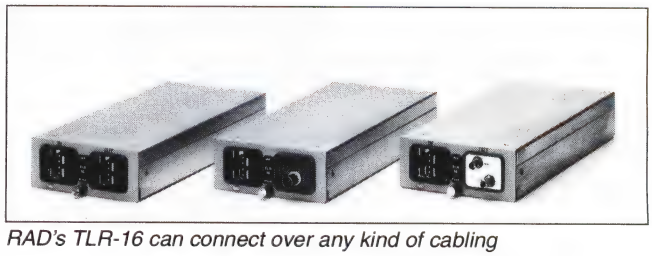
The UTP model has built-in media filters which provide independent noise suppression in the direction of the attached access unit or remote workstation. At 16Mbps the unit can provide lobe distances of: STP — 375 metres; UTP —175 metres; coax — 100 metres; and fibre optic — 3,000 metres.

Dataplex (03) 210 3333

ATM Switching Hub

General DataComm has just announced its new ATM switching hub for corporate networks. Called APEX, GDC officials say it supplies pure cell switching for ATM traffic and adaptation switching interfaces for non-ATM traffic. It also supports a diverse set of applications on a single platform, such as the interconnection of LAN hubs with ATM or Ethernet interfaces; circuit switched data, voice, image and video traffic; switching of frame relay and X.25 traffic; and transport of HDLC and SNA/SDLC framed information in a single backbone network.

When ATM interfaces become available in LAN hubs, APEX can act as a hub for existing LAN hubs, interconnecting multiple hubs at high speed, officials say. APEX is able to route and switch traffic between existing hub or bus-based Ethernet LANs with support for up to 64 direct LAN interfaces. APEX can also connect to high capacity PCs, workstations and servers via dedicated fibre optic links at rates of up to 155Mbps. The product can also be configured as a frame relay switch, providing up to 32 ports, each of which can operate at speeds of up to 52Mbps. Both HDLC or SNA/SDLC information streams can be transported, enabling ex-


RAD's TLR-16 can connect over any kind of cabling

CSM's package analyses business communications needs

isting SNA or router networks to be interconnected through a common ATM backbone, the officials claimed.

Because APEX can emulate a circuit switch it is able to transport voice and video from Time Division Multiplexers as permanent virtual circuits through the network at speeds of up to 2.048Mbps. In public network environments, it can be deployed as an ATM access switch supporting both permanent and virtual circuits.

It uses the industry-standard management protocols SNMP and TFTP, and employs a fault tolerant architecture based on a crosspoint switching fabric. All key logic modules and power supplies may be made redundant, and all cards are hot-swappable, so additional ports or modules can be added without affecting network operation.

General DataComm
(02) 956 5099

Telecommunications Analysis Package

Australian firm Calldata Systems Management (CSM) has developed a new telecommunications analysis package it says will help businesses understand and make the most of deregulation in the telecommunications industry.

Called Telecommunications Business Management Analysis Package, the software runs on a PC and collects information on the carriers, their services and charges. A CSM spokesperson said the package offered two main benefits to users. First, it contains a telephone management system, provides accurate billing analysis and traffic study analysis including line usage, evaluates available network service and records personnel performance, and generally gives businesses a much better understanding of their communications requirements and options. Second, the new package allows businesses to keep an accurate control over costs, manage their telecommunications time better, and identify productivity gains.

CMS (02) 906 8344

Proteon BOSS

Proteon has announced its new ProNET BOSS (Branch Office SolutionS), which combines the DNX 300 bridging router with the features of Proteon's Series 90 Smart Hub. Designed to meet the needs of the branch office, ProNET BOSS will support networking traffic including SNA and all major PC LANs, as well as multiprotocol traffic for minicomputer and major workstation environments.

It comes ready to use, preconfigured for quick set up, and has dual WAN ports for backup, redundant power supplies and hot-swappable modules.

Users of ProNET BOSS can achieve unified hub/router management via Proteon's Oneview 2.0 network management software, which incorporates several new features such as autoconfiguration for Token Ring beaconing, automatic port-to-node mapping, network statistics, event management, dynamic graphical updating, multiring management, and out-of-band management.

In the branch office environment, BOSS consolidates terminal traffic with local LANs in IBM/SNA applications utilising a single WAN connection. For PC LANs it provides NetWare routing independent of the applications servers. For workstation networked environments it provides high performance IP routing and spanning tree bridging. It fully supports DECnet Phase IV and V as well as AppleTalk I and II.

ProNET BOSS comes in two office-ready models for Ethernet and Token Ring with 20 LAN ports and two WAN ports. The product can also be ordered to suit a user's specific custom configuration needs.

Hayes' Millennium 8000 can support up to 128 devices

Hayes Debuts Communications Platform

Hayes Microcomputer Products last month released its Millennium 8000 Network System, a high density communications platform designed to provide a long term, upgradeable solution for wide area connectivity.

A rackmount system that provides for up to 16 Line Cards and two System Controller Cards, Millennium 8000 enables network users to mix a variety of circuit and packet switched data communications technologies while at the same time providing access to communications servers and hosts, company officials say. Each Line Card can support up to eight communications devices and each Controller Card provides system management and LAN access. Available cards include the Dual Ultra 144 modem card, which supports V.32*bis* and V.42*bis* connections and also provides SNA, X.25 and ISDN connectivity; the Dual Ultra 144 Connector card, which provides two RS-232 DTE connections; and the System Controller Connector Card — Ethernet, which provides Ethernet network access through UTP and thick and thin coaxial cabling.

Built to a modular design, the system is managed by Windows-based Control Station Software and can accommodate dual power supplies. The Control Station Software allows for device configuration and status monitoring as well as alarm monitoring and logging. Depending upon configuration, prices range from $1,800 to $2,000 per port.

MPA International (03) 724 4444

Proteon has also announced a new addition to its range of internetworking products, the GNX 400 gateway. The gateway transports existing SNA/SDLC information over bridging router-based high speed LAN and LAN/WAN networks.

Proteon officials say the product eliminates the need for dedicated SNA/SDLC lines, allowing net managers to migrate to a fully integrated LAN/WAN internetwork, while still accommodating SNA equipment. The merging of SNA traffic on the LAN means improvements in response times and better reliability because of the ability of router technology to route traffic around failed links, they claim.

The gateway supports up to 16 SDLC lines in point-to-point, multidrop or dial-up configurations. Prices start from $15,000.

Proteon (02) 955 8555

Microfax is designed and manufactured in Australia

Microfax Turns Printers into Fax Machines

Microfax, an Australian designed and manufactured miniature send and receive fax and data modem, has been released by Sydney-based X-direct. Priced at $495, the new pocket-sized modem can receive and print fax and data messages directly on most printers — without an attached computer — and also transmit faxes from a PC without fax software; retrieve stored faxes from from a remote location; and redirect incoming faxes to another location.

With 4MB of RAM, Microfax features a parallel printer port, serial port, telephone interface and internal power supply. It is fully compatible with CCITT Group 3 facsimile standards and V.22*bis* and other data transmission standards.

Company officials say Microfax can share a telephone line with a normal handset, will automatically retry engaged numbers, can be programmed with a security PIN number and controlled by a touch-tone telephone from a remote location.

X-direct (02) 646 5155

Mac ISDN

NetComm has been appointed the official distributor for ISDN software products from Macintosh ISDN manufacturers Access Privilege and EuRoNIS.

Access Privilege products, The Link and Easy Transfer, are remote communications products designed to be used independently over ISDN, X.25 or analogue lines. According to NetComm officials, The Link is the only software product capable of transparently interconnecting remote AppleTalk networks through ISDN and X.25.

It was developed through a partnership between Access and Apple Computer, and is based on Apple routing technology, AppleTalk Internet Router and Access Privilege telecom technology. It supports all AppleTalk, EtherTalk and TokenTalk protocols, can interface with all Mac communication ports, and a Macintosh running The Link can manage up to 8 simultaneous connections.

Easy Transfer is a high speed file transfer program that allows the transmission and receipt of documents via modems, X.25 or ISDN without the need for any special knowledge of telecommunications. The program uses a very fast security protocol including APC compression, and can be used for real time file transfer, or users can nominate to use a batch function that will transfer files to a pre-determined destination.

EuRoNIS' Planet ISDN NuBus Terminal Adaptor has been designed for all modular Macintoshes equipped with NuBus slots, and enables transparent communication with ISDN services throughout the world, according to NetComm officials.

The adaptor offers both asynchronous and synchronous data transfer modes, and incorporates two B channels and a single 16Kbps D or signalling channel. Synchronous operations are carried out directly via the NuBus slot using HDLC framing, giving a throughput of 64Kbps.

The Planet Terminal Adaptor retails for $2,995. The Link sells for $999, and Easy Transfer costs $699. Purchasers of both The Link and Easy Transfer can buy an EasyPak that combines both products for $1,395.

NetComm (02) 888 5533

Andrew Adds SNMP

Andrew has announced that it has added SNMP support to two of its local bridges, the Bridgeport/7606 and Bridgeport/7606. The bridges can now be managed by SNMP management systems such as Hewlett-Packard's OpenView, Sun's NetManager, IBM's NetView/6000 and Andrew's DOS and Windows-based Bridge Manager.

The Bridgeport/7606 SNMP Agent allows the bridges to be managed by up to four SNMP Managers in a network. It will support: MIB II (RFC1231); and Definition of Managerial Objects for Bridges (RFC1286); as well as Andrew 7606 MIB (ADRW7606).

Andrew's 7606 MIB provides additional configuration parameters, operational parameters and performance reporting. The software upgrade for existing users ranges from $520 to $650 per unit.

Andrew (03) 357 9111

New Pocket Modem

NetComm has released a new, fast pocket-sized modem that incorporates fax capabilities.

The new Pocket Rocket E7F measures 7.5cm by 3.2cm by 10cm, and can achieve throughput of 57,000bps via V42 error correction and V42*bis* data compression, according to officials from NetComm.

The Pocket Rocket E7F includes Class II fax capabilities and will support speeds of up to 9,600bps. It comes with MicroPhone Pro software, which provides users with an integrated data/fax solution, according to NetComm. The new modem operates over both the PSTN or leased lines, and offers fully automatic modem operation in both send and receive modes, with automatic detection and adjustment to the speed of the incoming call.

The Pocket Rocket E7F will also support NetComm's X.32 upgrade software for use with X.25 packet switched networks. It sells for $1,299.

NetComm (02) 888 5533

Cisco FDDI Interface

Router vendor Cisco Systems has introduced a low cost FDDI interface card for its midrange Cisco 4000 router platform.

The Cisco 4000 FDDI router is one of the lowest priced FDDI router/bridges on the market, with prices starting at $28,000, according to company officials.

The new three-slot unit holds one FDDI Network Processor Module, with the remaining two slots holding a combination of Ethernet, Token Ring and serial interfaces.

Designed for low-end access to FDDI networks, the unit lets users with FDDI 100Mbps corporate backbone networks extend FDDI technology to their smaller LAN workgroups cost effectively, according to officials from Cisco.

The Network Processor Module of the router supports a full set of FDDI fault-tolerant and redundancy features including: Dual-attached station for continuous operation if a station or cable plant fails; optical bypass switch support, which prevents ring segmentation caused by multiple station failures; single-attached station for connecting to concentrators; and dual homing for both redundancy and increased availability in concentrator environments.

The unit operates on multimode fibre for distances of up to 2km between stations.

The Processor Module supports multiprotocol routing and multiple bridging techniques, including remote source-route bridging, encapsulation bridging and transitional bridging.

Cisco Systems (02) 957 4944

Wandel & Goltermann's DLA-6 has a range of 20Hz to 200kHz

Handheld Tester

A new handheld battery powered instrument for testing analogue circuits has been released by Wandel & Goltermann. The Data Line Analyser DLA-6 has a frequency range of 20Hz to 200kHz, and can be used for commissioning and maintaining speech circuits, leased data circuits, and for selecting suitable cable pairs for the ISDN Basic Rate U-Interface.

Officials said when users make measurements of group delay and attenuation distortion, result curves are swept automatically and displayed graphically on a high resolution LCD. Users can then judge the quality of a circuit by comparing a curve with a CCITT or user-programmed tolerance mask.

The DLA-6 can be used for measuring both 2-wire and 4-wire circuits, and built-in dialling and loopholding capabilities enable it to set up and test standard 2-wire switched telephone circuits. The instrument's built-in microphone and loudspeaker allows users to communicate across the circuit under test and to monitor the circuit for any signals.

The company has also announced two handheld field service instruments which have been designed for the commissioning, maintenance and trouble-shooting of 2Mbps circuits.

The Frame Analyser PA-40 and Frame/Signalling Analyser PA-41 both have two receivers, enabling both directions of a 2Mbps circuit to be monitored simultaneously. Both new instruments have one transmitter.

The company says both offer an extensive range of measurement applications — including framed monitoring in both directions simultaneously, framed end-to-end testing, drop and insert testing, channel associated signalling simulation and analysis, mux/demux testing, digital cross connect testing, automatic protection switch testing, and also unframed end-to-end testing.

Wandel & Goltermann
(03) 690 6700

W&G's new PA-41 is designed to monitor 2Mbps signals

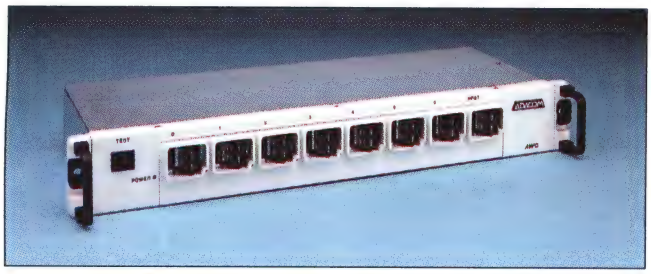
NETBuilder family

3Com has enhanced its NETBuilder software, which is part of the company's NETBuilder internetworking products. Features include Boundary Routing System Architecture, data compression for all major bridging and routing protocols, IPX SAP filtering, X.25 connection and gateway service, and low-speed line support.

The X.25 connection complements existing bridging and routing features across the NETBuilder platform, and enables the product to act as an X.25 gateway, providing PAD capabilities so that Ethernet LAN-attached terminals or hosts can talk via X.25 to an X.29 host or terminal.

As well as offering support for lower line speeds of 1,200 to 9,600bps, NETBuilder now has the ability to group two low line speeds as a single logical connection to ensure reliable connectivity between sites. Pricing ranges from $400 to $3,250.

3Com (02) 959 3020



Adacom's AWC is designed for AS/400 and System 3X computers

Pocket Print Server

Wholesale Technology has announced the release of the Xircom Pocket Ethernet Print Server. Xircom officials claim the product is a flexible way of connecting a parallel printer anywhere on an 802.3 Ethernet local area network.

The Print Server has 128Kb of RAM, and connects externally to a PC's parallel port, without the need for internal expansion slots or special installation tools. A Wholesale Technology spokesperson said the new device eliminates the need to connect networked printers to file servers. Printers can be connected anywhere on a local area network by connecting the Pocket Print Server to the printer's parallel port, plugging in a small power supply and connecting the local area network cable.

The unit will come complete with its own installation software, and also features LEDs for diagnostics and troubleshooting. It is compatible with a wide range of printers and plotting devices, PostScript and PCL languages, and Novell NetWare 286 and 386, and it can support up to 8 file servers and 32 printer queues.

Wholesale Technology
(02) 368 4800

Wiring Concentrator

Dataplex has announced the release of the new Adacom Active Wiring Concentrator (AWC), designed for use with IBM AS/400 and System 3X computers. The concentrator will provide host/device distances of up to 1.2km using ICS, 1.5km with twinax, and 3km with fibre optic, according to company officials.

It allows the connection of seven twinaxial devices in a star configuration while giving each device the impression that it is the only one attached to the host. Officials say it is entirely fault tolerant, and streaming devices or shorted cables can be easily detected and isolated without disrupting other devices.

Dataplex (03) 210 3333

Alcatel Voice Services

Alcatel has announced the addition of the Voicelink Intelligent Call Management System to its portfolio of voice services. The product is a predictive dialling system that automates the process of operator-generated outgoing calls to customers.

The Voicelink system makes telephone contact with customers, and screens out unproductive contacts like answering machines, unanswered calls, engaged signals and disconnected numbers. When a productive, or 'live,' call is established, Voicelink supplies the call to the operator and displays that customer's information on their computer screen.

The new system can automatically adjust the outgoing call rate to deliver a steady stream of live contacts to phone operators. An optional feature called Intelligent Call Blending mixes both ingoing and outgoing call operations, resulting in improved operator efficiency. The new Voicelink systems range from a 3-workstation, 8-line model up to a 48-workstation, 96-line model.

Alcatel (02) 925 7200

Lotus, Retix Team Up

Lotus Development and Retix have recently announced a partnership which is aimed at providing X.400 messaging capabilities to Lotus' Notes software. The new Lotus Notes-to-X.400 Gateway will allow Notes users to communicate with users running any other electronic mail system through X.400 services.

The product is used in conjunction with Retix's OPENServer 400 messaging server, which is available for OS/2, DOS and Unix. Retix officials said its Lotus Notes-to-X.400 Gateway and OPENServer 400 products are able to run on the same OS/2 computer as the Lotus Notes server, providing an integrated enterprise-wide messaging system and eliminating the expense of buying more hardware.

Like Retix's other OPENServer Gateways to X.400, the Lotus Notes Gateway to X.400 maps the proprietary e-mail format into international standard X.400 format. The OPENServer messaging server then routes the X.400 message across the network to its destination. Users continue to send e-mail in the format they're accustomed to, and receive mail from other users in the Lotus Notes format regardless of the e-mail package used by the sender. The Alias-Mapper provides alias mapping for automatic alias and originator/recipient name generation based on rules defined by the system administrator. The Auto-Registry feature provides automatic registration of foreign, incoming and outgoing X.400 names into the alias database.
Retix (03) 629 2595

Microwave Test

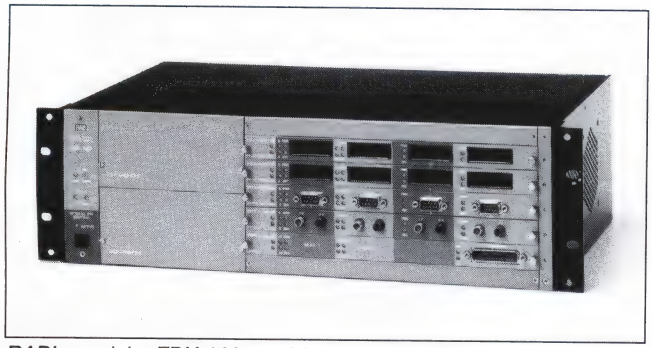
Marconi Instruments claims to have released the world's first portable 46GHz microwave test system.

Part of Marconi's 6200 series family, the 6204 46GHz Microwave Test Set offers fully synthesised operation with 1Hz resolution to 26.5GHz, and 2Hz resolution to 46GHz. The source can be used in CW mode locked to an external reference for tests requiring extremely high stability and high resolutions.

Marconi's microwave test system offers 2Hz accuracy up to 46GHz

In swept mode, the 6204 is fully synthesised at every point in the sweep, allowing very narrow band devices such as SAW and crystal filters to be easily tested. A 400-point fully synthesised sweep takes just 200ms or less, according to Marconi.

For locating faults in waveguide, the distance-to-fault option offers a real-time frequency domain reflectometry technique to find discontinuities with high accuracy and resolution, said the company officials. The unit comes in a compact pack-



RAD's modular FDX-100 provides up to 20 FDDI lobe connections

age, weighs less than 20 kilograms, and the company claims it is around 50% cheaper than conventional systems which use discrete instruments.
Marconi Instruments
(02) 638 0800

NetWare Management

Novell has released version 1.1 of its NetWare Communication Services Manager, a real-time Windows-based network communications management application for managing multiple NetWare for SAA 1.3 or NetWare Asynchronous Communication Services 3.0 servers for NetWare-to-IBM host or remote network communication services.

The new version features enhanced centralised management functions and better events and failure notification to simplify the management of multiple servers, and to provide detailed status and configuration displays for preventative and reactive network management.

The NetWare Communication Services Manager can run with Novell's NetWare Management System or as a standalone application. Company officials said it will be priced at $6,670.

Novell has also announced enhancements to its extended LAN access product NetWare Access Services version 1.3.

The new release supports Windows applications and features enhanced memory management, allowing multiple Windows and DOS applications to run efficiently, say Novell company officials.

Users will also be able to consolidate modem access on a NetWare Asynchronous Communications Services version 3.0 server, allowing the use of fewer modems and streamlining management of network access. Novell NetWare Access Services version 1.3 sells for $4,070.
Novell (02) 413 3077

FDDI Hub

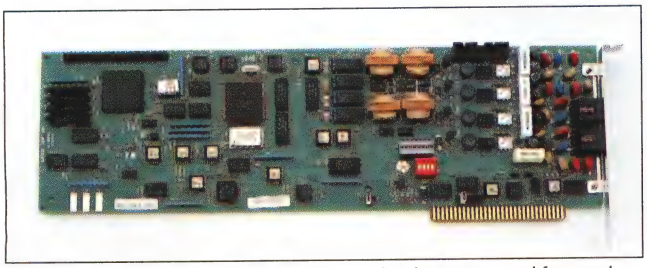
RAD Data Communications has released a new modular FDDI hub called the FDX-100. The unit supports both STP and fibre optic cable, and provides a fully redundant FDDI backbone for connecting routers, bridges, computers and workstations, according to RAD officials.

The FDX-100 has 5 slots, and is able to accommodate a variety of Physical Access modules supporting single mode and multimode fibre or STP cabling. It can be installed as a single standalone unit with up to 20 FDDI lobe connections, or as a backbone interconnect unit for a larger network via the connection of additional hubs.
Dataplex (03) 210 3333

Net Engineering Tools

Adacel has announced MIL 3's OPNET (OPtimised Network Engineering Tools) software, a comprehensive design, simulation and analysis environment for designed for communication network engineers.

The workstation-based CAE system includes hierarchically



Dialogic's D/41D-AN offers four-channel voice store and forward

related graphical editors for the specification of network architecture, node structure and network protocols. Event-driven simulations can be automatically generated from user specifications or from libraries of in-built models. Users are able to simulate a variety of network environments including LANs, WANs, wireless networks and mobile radio links. Post-processing utilities assist users to analyse the results of simulations. OPNET is supported by a range of workstation platforms including Sun, HP, DEC and Silicon Graphics.

Adacel (03) 596 2991

Call Processing Board

Dialogic's new D/41D-AN Digital Signal Processor call processing board is now available in Australia, after receiving Austel approval recently.

Company officials said the D/41D is a four channel voice store and forward board for use in a wide range of applications in call processing and intelligent monitoring. It has been approved for use without line isolation units.

The board features Pitch Perfect Sound Control, which enables listeners to run through a recording at high speed without sacrificing clarity, and Level Perfect volume control, which allows any caller to adjust the sound level. The product also has a Global Tone Detection ability, which allows it to recognise signalling and control tones from different countries around the world.

Company officials also said the board provides accessibility to a range of complementary products — like speaker-independent voice recognition cards — through Dialogic's analogue expansion bus.

Dialogic +64 9 302 1831

Send Voice, Data, Fax

Interlink Electronics claims its new Voidax range will make modems, faxes and answering machines redundant. Officials say the Australian-designed and made Voidax (VOIce DAta faX) dial-up modem is able to send and receive data files, faxes, e-mail and voice files at speeds of 14,400bps, and can also answer your phone.

Voidax works with a PC or Mac via Quicklink II software. In data mode it supports V.32*bis* and V.32. It supports MNP 4 and MNP 5 and V.42 and V42*bis* correction and compression protocols, and provides DES data encryption, dial back security, leased line and synchronous mode, and remote configuration of modem functions.

In fax mode, Voidax supports Group III, TR29 class II August 1990, 9,600bps send and receive, and V17 14,400bps operation in send and receive mode. Voidax can also support Voice Mail and function as an answering machine. The Voidax II sells for $599, the Voidax III for $749 and the Voidax Pro for $1,099.

Interlink Electronics
(02) 362 4344

Tools for Visual Basic

DDP has announced Attachmate's Extra! Tools for Visual Basic, a package that works with Microsoft Visual Basic 2.0 and lets users create Windows-based programs with transparent connectivity to mainframes.

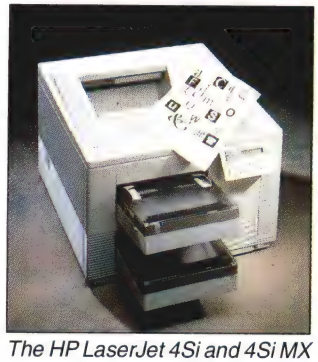
The package comprises Custom Controls, a Common Function Library, and a set of sample applications. Custom Controls are graphical objects that appear on a window or dialogue box and provide interaction with mainframes, replacing the need

for multiple API calls. Users just select a graphical item from the Visual Basic screen, and do not need a knowledge of programming. The Common Function Library has functions to automate mainframe activities like file transfer. One command replaces a number of HLLAPI calls, and users do not need a knowledge of HLLAPI programming. Extra! Tools for Visual Basic requires Windows 3.0 or higher, and is priced at $570.
DDP (03) 694 6711

HP Network Printers

Hewlett-Packard has released a new pair of network printers than can work concurrently with PCs, Macs, Unix workstations and multiple networks.

The LaserJet 4Si and LaserJet 4Si MX offer 600dpi resolution and have a throughput of 17 pages per minute. The 4Si has 2 Mbytes of memory, and includes enhanced PCL 5, while the 4Si MX comes with 10 Mbytes



The HP LaserJet 4Si and 4Si MX can deliver throughput of 17ppm

of memory, enhanced PCL 5, Adobe PostScript Level 2, and an HP JetDirect Ethernet interface that is able to automatically switch among 10 different network operating systems.

Company officials claim the printers' Intel 80960CF RISC processors, combined with better PCL and Windows PostScript drivers, enable the machines to output complex 600dpi text at close to the rated engine speed of 17ppm. The JetDirect interfaces send data to the printer in 1,024-byte packets, as opposed to a one-byte data stream from a standard parallel port. This enables them to accept data at 350 Kbytes per second, about 30 times faster than standard parallel interfaces, according to HP.

The new printers provide fast PostScript printing by using the special technique of formatting pages in a buffer while others are printing. Most printers have to format and print a page before starting on the next, slowing their performance.

Page buffering together with instant input/output switching improves overall performance by providing a continuous print stream as the printer switches between enhanced PCL and PostScript Level 2, according to Hewlett-Packard officials.
Hewlett-Packard
008 033 821

SynOptics Price Cuts

SynOptics has announced price reductions for its range of LattisNet FDDI intelligent hubs.

The Lattisnet System 2000 FDDI Workgroup Hub Model 2912A, which has 12 STP master ports and two fibre optic A/B ports, has been reduced by 36% to $18,1564, or $1,326 per port.

The prices of FDDI modules and chassis for the LattisSwitch System 3000 modular intelligent hub, which supports multisegment Ethernet/Token Ring/FDDI have also been reduced.

The FDDI Fibre Optic Host Module Model 3904 now sells for $10,203, a reduction of 27%, and the FDDI Network Management Module Model 3910S-04 has been reduced by 33% to $18,564. The FDDI Host Module Model 3902A now costs $6,964, a drop of 25%.

SynOptics has also announced that it has started shipping a new range of FDDI hosts and network management modules which will support the single-mode fibre connection necessary for building metropolitan area networks and extended campus networks.
SynOptics (03) 853 0799

The Forum at Asia TELECOM 93 - have a voice in Asia's future

A US$ 100 billion telecommunications market is on your doorstep. In Asia. Home to half the world's population.

You have the products, the technology, the ideas. But are you talking to the right people?

There is one place where you'll get right to the top. The Asia TELECOM 93 Exhibition and Forum, Singapore, from 17 through 22 May 1993. We'll bring you industry and government officials, technical, economic and legal experts - the decision makers of the region. You'll be involved in the latest telecommunication developments and have the opportunity to interact with the leaders shaping Asia's telecommunications future.

The Asia TELECOM 93 Forum is organized by the International Telecommunication Union. We're making it the most important event in telecommunications, because we want you to meet the right individuals in a privileged and exclusive environment.

The Forum. To share information with the right people.

The Forum is built on four symposia:

- Policy Symposium 17-19 May
  "Strategy for expanding telecommunications infrastructure"
- Technical Symposium 19-22 May
  "Technological challenge: interfacing regional needs"
- Regulatory Symposium 18-19 May
  "Effective transition through regulation"
- Economic Symposium 20-21 May
  "Telecommunications: the platform for economic growth and development"

For registration: call +65 290 5821 or 5817 - fax +65 292 7577
For information: call +41 22 730 5927 - fax +41 22 740 1013

Asia TELECOM 93
SINGAPORE
17-22 MAY 1993

Bozell

Teleworking From afar and the Technology Culture Imperative

The telework revolution is upon us. Telework is now commonplace. In offices from Montreal to Melbourne, the workforce is becoming increasingly decentralised and liberated from what can be counter-productive nine-to-five routines.

PTC has promoted the telework concept and its application for many years. Telework was seen chiefly as a means of enabling remote and rural areas to sustain and nurture development, and to prevent the increasing depopulation and brain drain of, for example, the Pacific Islands or the rural regions of North America and Australia. PTC also recognised, quite early on, the potential for using telework centres — mini-offices in suburban areas — as a means of reducing urban congestion.

Telework applications have greatly surpassed our early initiatives, and it is heartening to know PTC was a part of this genesis. However, as ever, we fell victim to the inevitable Law of Unintended Consequences — that is, no matter what the plan is, the result will inevitably be a surprise. The largest application of telework and its greatest area of growth remains the empowerment of urban employees in developed countries to work in their homes. Telework has been a factor in the growth of what Joel Garreau calls the 'Edge Cities' of North America: High-tech suburban environments built on the edges of old metropoles. In contrast to Toffler's 'Third Wave' predictions, there is evidence that people, especially in high-tech industries, need the stimulus of big cities and fellow professionals, even if that city is an hour or more's drive away. Cities have their attractions, perhaps especially so from afar.

Worldwide, the 'brain drain' of rural and remote regions has not lessened. If anything, greater electronic links to the metropoles has only whetted the appetites of the more ambitious and globally-minded youth and promoted their departure from 'backwaters.'

I must admit that these thoughts about telework are a product of PTC's own location in Hawaii. While difficult to explain to people from colder and less scenic climates, Honolulu is an expensive and often difficult location, and is less a city than an over-populated island. As a recent book entitled *Price of Paradise* attests, 'the local market of 1.1 million people is not as sophisticated as those in the major cities of Asia and the West, and those markets, in turn, are a long way away . . .' In the telecoms industry, we are in a bit of a backwater. Does this matter? If I am connected via satellite, fibre optic cable, e-mail and fax, can't I sit back and enjoy the sunshine? Well, up to a point.

I believe the difficulty experienced by Hawaii in attempting to attract high-technology and telecommunications industries is characteristic of the problems faced by many Pacific Islands, and indeed rural and remote regions generally. At least Hawaii can exploit US-wide economies of scale. But even this is a double-edged sword. Hawaii's trade is linked to US-flag merchant carriers. This means a car imported from Japan will be shipped via Los Angeles and enjoy a price mark-up of $US2,000 to $US5,000. General price levels are 38% higher than US mainland, and it is against those low prices that local prices are compared. There is little local competition, and the cost of doing business suffers from monopoly pricing for goods and services.

The November 1991 issue of *Hawaii Business* looked at the failures of Hawaii's high-tech initiatives. The article cited perhaps the most important factor — the lack of a technology 'community' or 'mind-set.' Sadly, nice weather is not enough. Silicon valleys and high technology development centres tend to grow up around existing pools of talent, and in environments that encourage and foster excellence. California's Silicon Valley developed around the intellectual dynamism of Stanford University, the Lawrence Livermore Laboratories, the University of California at Berkeley, and many other centres of learning. Can the Pacific Islands (including Hawaii) ever hope to replicate these qualities on a foundation of cane plantations, rural poverty, and fatalism?

Better telecommunications and transportation are relegating Hawaii and other Pacific Islands to increased, not decreased, marginalisation. This is not too surprising — after all, Newfoundland or the Azores can't really promote themselves as the 'telecoms and transport hubs of the Atlantic,' whatever their other qualities might be. Flights between the Pacific 'pleasure periphery' and the Pacific Rim centres cater to tourism not business, and telecoms services lag behind developed country norms. ISDN is a pipe-dream.

Note that teleworking is not the same as advanced rural and remote telecoms. Instead, it is an attempt to replicate (and indeed improve) the qualities of an office from a location some distance from the office centre. To an ever-greater extent, PTC 'teleworks' around the world with our members, as we enjoy little interaction with the local island economy or polity.

> *"Better telecommunications and transportation are relegating Hawaii and other Pacific Islands to increased, not decreased, marginalisation."*

Which leads to the point raised by a 1991 survey in *The Economist* of the Pacific Islands. Following the law of comparative advantage, the islands should play to their strengths — that is, tourism. It is unrealistic, expensive, and pointless to do anything else. Tourism requires advanced telecoms, but advanced telecoms are largely transparent and user-friendly at the distant terminal (for example, the tourist resort).

PTC has established a Special Task Group on Telecommunications in the Travel and Tourism Industry to build upon our past initiatives in linking these two important industries. We are working with the Pacific Asia Travel Association and the Pacific Rim Institute of Tourism, as well as other organisations, to pursue such concepts as on-line destination databases, tele-resorts, and the many other potential applications in this field.

But what are the implications of attempting to import a technology culture to such environments? Does it not bring us back to the heart of the problem, paraphrasing (rather badly, I'm afraid) the First World War tune: 'How Will You Keep Them in the Isle, Once They've Seen Sydney?'

Postscript: For a contrasting and perhaps more upbeat view, I direct readers to Thomas McPhail's article on successful rural and remote applications in the forthcoming *Pacific Telecommunications Review*. More information is available from the PTC office, Tel: +1 808 941 3789, or Fax +1 808 944 4874.

James Savage is the Assistant Director, Pacific Telecommunications Council and Editor of Pacific Telecommunications Review.
[NOTE: The views put forward in this article are those of the author and do not necessarily reflect official policies of the Pacific Telecommunications Council.]

INS leads the way

TEST INSTRUMENTATION • NETWORK MANAGEMENT SYSTEMS

TDR/LAN SCANNER

- TDR and cable scanning for UTP, STP, Coax, IBM cabling.
- Measures NEXT, length, ATTENUATION, Resistance, continuity, LAN monitor.
- Optional cable management and cable grading software.

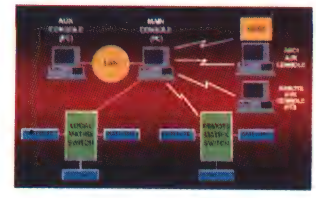
INTERVIEW 8000 WAN ANALYSERS

- High performance protocol test system for field and LAB use.
- Supporting C, SS7, Frame Relay, ISDN, X25, SNA, QLLC and user decodes.
- Interfaces for RS232, V.35, X.21, G703, T1.

PC-BASED BERT

- Turn your PC into high speed BERT.
- Support RS232, V.35, X21, G703, G704.
- G821 analysis with histogram and capture to disk.
- G704 monitor tool.

MATRIX SWITCH



- Non-blocking
- 12 to 4096 ports.
- Mix protocol speeds and interfaces.
- Netview support.

LIGHT SOURCE/OTDR/ POWER METER

- Fiberoptic test equipment for LAN, WAN, FDDI.
- PC-based and hand-held.
- Power attenuation, dual wave length test systems, LED or Laser sources, Talk sets.

NETWORK PROBE

- Multi-function analyser.
- Built-in interfaces for RS232, X.21, V.35, ISDN.
- Multiple protocols support.
- Light weight/low cost.
- AC/DC operated.

LAN/WAN ANALYSER

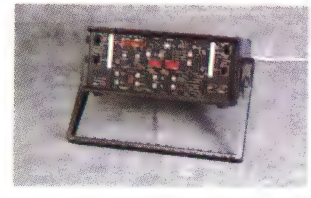
LAN: Token Ring
ETHERNET

WAN: ISDN
FASTPAC
AUSTPAC
TRANSEND
DDN
SNA

PROTOCOLS:

X.25, SNA, HDLC, SDLC, SS7, Q921/Q931, XNS, TCP/IP, NETBIOS, NETBUI, ISO, APPLETALK, MBI, DECNET, SUNNFS, X-WINDOWS, SNMP.

SIMULATORS

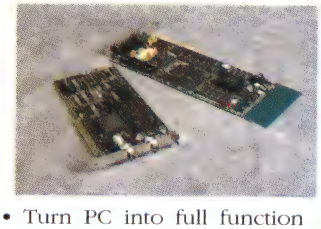


- Most major Telephone network types.
- DDS, ISDN links.
- DDS, ISDN cables.
- Multiple cable gauges, length and speed up to 34.8MBPS.

DATA PATCH/ SWITCH SYSTEMS

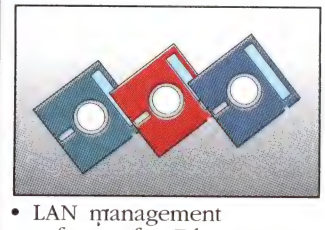
- Circuit switching and PATCHING.
- RS232,. V.35, X.21, G703 etc.
- Transparent to protocol.
- Full remote or local control.

PC-BASED PROTOCOL ANALYSER



- Turn PC into full function protocol analyser.
- Half size card supporting major protocols, interfaces.
- Speed up to 256KBPS.

SOFTWARE



- LAN management software for Ethernet, Token Ring, ARCNET and Appletalk.
- Comprehensive statistics and protocol decodes.
- Low, low, cost!

Please send me more information on:

☐ TDR/LAN SCANNER ☐ INTERVIEW 8000 ☐ PC-BASED BERT ☐ MATRIX SWITCH ☐ OTHERS
☐ NETWORK PROBE ☐ LAN/WAN ANALYSER ☐ SIMULATOR ☐ DATA PATCH/SWITCH SYSTEM
☐ FIBEROPTIC TEST EQUIPMENT ☐ SOFTWARE ☐ PC-BASED PROTOCOL ANALYSER

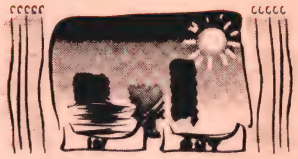
NAME: _____ ADDRESS: _____

ORGANISATION: _____ PHONE: _____

INS
ACN: 003 338 476

INFORMATION NETWORK SOLUTIONS PTY LTD
Unit 3a, 3 Lanceley Place Artarmon, NSW, 2064
PHONE: (02) 906 - 6335 FAX: (02) 906 - 6327

ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP



From the desk of the Executive Director

Preselection — A Critical Issue For the Carriers

An issue likely to dominate the telecommunications scene and, for that matter, the interest of the whole Australian public, is that of preselection.

All users of the telephone are going to have to opt for one or other of the two carriers, Telecom or Optus, as their carrier of choice. Having made that selection, all they need to do is dial the desired eight digit STD or the longer international number and they will automatically be switched to their preselected carrier.

Preselection is not about selecting your carrier to dial local numbers — or at least not yet. Telecom will continue to carry local loop traffic for the foreseeable future.

ATUG recommended, during the debate leading up to the *Telecommunications Act 1991*, that preselection should be the means by which customers connect to their carrier of choice. We made the recommendation with two objects in mind: firstly, selection of carrier should be made as simple for users as is possible; and secondly, both carriers should have an identically equal opportunity to win and maintain their customer base.

The customer's choice will be registered at the local telephone exchange in order that the carrier can provide the customer with long distance and international service. However, if a customer has opted for, say, Optus and wishes to take advantage of a Telecom special offer, the customer could access Telecom by using the four digit override code 1411.

The Ballots

Austel has, for some time now, been overseeing the negotiations between Telecom and Optus, regarding how the ballot for preselection will be conducted. A 'preliminary understanding' has been reached, although some issues remain to be resolved.

The importance of preselection, to both carriers, should not be underestimated and we should not be surprised to find them a little coy about their respective positions on the matter.

In this respect, ATUG plans to hold a debate at the ATUG'93 conference on preselection and had arranged with the ABC's *Four Corners* to film it for later presentation. Both of our carriers though, were reluctant to submit their Chief Executives to the detailed scrutiny of a public audience and ABC presenter, when they had no control over the breadth of coverage of the issue and its peripheral arguments about quality of services.

It was a bit like subjecting Dr Hewson to detailed questions about the GST during the recent election. The carriers cannot afford to slip up in an uncontrolled environment, with such huge dollars at stake.

Sydney, Melbourne, Canberra First

The first ballots will take place in the three major capitals Canberra, Sydney and Melbourne. In the latter two, a split ballot in two areas is likely, so that ballot forms go out to people in Area 1, to be returned in 3 weeks. The ballotter will count them over the next week and decide whether a second ballot is necessary. At about that time the ballots will go out for Area 2.

In Sydney, it is rumoured that the division will be North/South, separated roughly by the main harbour. Ballots will then go out throughout Australia, over the next four years, to individual areas, provided they have experienced the dial '1' option for at least five and preferably nine months.

After the initial selection, each customer will be able to change his or her selection, arrangements for which are still being discussed. After the first change, which may be free, there may be a small ($5 to $10) charge. Whether the carriers will absorb this fee is still unknown.

It is understood that up to about a 65% response rate would be thought reasonable, and that if that many are received in a single area, there would be no second ballot. After the second ballot, it seems likely that the ballotter will call it a day and those who did not return a selection will remain Telecom preselected.

As preselection is only for long distance and international services, Optus customers will receive two bills, the second being from Telecom for line rental and local calls.

Contrary to our expectations, Optus tells us that they do not think it feasible to offer local calls. We find that surprising, even if they were to break even, as there would be some goodwill generated. In addition, Telecom continues to claim that it loses money on all local calls, except those made in major CBD areas.

This situation obviously will change over time, as Optus runs fibre into major buildings and eventually ventures into the local loop, possibly by radio. But, in the meantime, Telecom can be expected to emphasise its one-stop shop facility, with one bill.

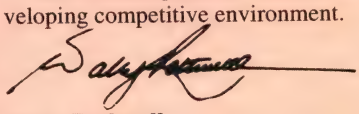
There are unresolved billing questions, such as what happens when a carrier offers a VPN or Centrex service where an integral distance carriage component cannot be separated out? In addition, both carriers use different switching equipment and slightly different Common Channel Signalling systems. Both problems have solutions, but is there a will between the carriers to do anything about them?

Negotiations Near Completion

We should soon know the answers to outstanding problems. The ballotter and PR companies should be selected in late April/early May.

At the time of going to press it's also rumoured that Schedule 13 (Pre-selection) to the Access Agreement between the carriers is 95% complete. Let us all hope that 13 is not an ominous number for such an important issue, and that preselection works as it is intended to. It has to work, if users are to have a simple system, until technology allows preselection through a small black box by your telephone.

That interim period is critical to our developing competitive environment.



Wally Rothwell
Executive Director

CT3 Communications at ATUG'93

One of the very latest advances in PABX system technology is cordless telephony. Nira Australia Pty Ltd and Ericsson will release their latest cordless PABX system, the DCT900 Business Cordless Telephone, at ATUG'93.

The new system uses CT3 technology, and, to help demonstrate its usefulness, the two companies have provided ATUG with a 15-handset system for all its communication purposes during the four days of the ATUG'93 conference and exhibition. The area that will be covered by the digital cordless telephone system at Sydney's Darling Harbour will include the exhibition halls, the foyer, the walkway to the convention centre, the ground floor and the first floor of the convention centre, as well as the banquet area.

System Features

The system consists of three basic units:

- A radio exchange which is usually mounted next to existing PABX;
- Radio base stations at various locations around the site to ensure full radio coverage and adequate traffic capacity; and
- Pocket portable telephones which weigh 200g and come with rechargeable batteries.

The conversations of system users, as they move around the exhibition, will be automatically transferred from base station to base station without any interruptions to their call.

"The voice quality is at least as good as the existing wired extensions, and the radio transmission is fully encrypted to ensure callers' privacy," Nira's Managing Director, Brian Fitzgerald said. He added that, unlike existing cordless tele-

ATUG'93 Awards

Last year ATUG introduced a number of awards to recognise the efforts of individuals in Australian telecommunications. These awards were presented during ATUG'92, and this year the awards will be presented again at ATUG'93. They include the Charles Todd Medal for Communicator of the Year and the Communications Journalist of the Year award.

During ATUG'92, the Charles Todd Medal was presented to Professor John L. Hullett. The editor of *The Australian's* Business Communications section, Helen Meredith, won the award for Communications Journalist of the Year. This year, ATUG has expanded its theme of awards to introduce the ATUG Award for Excellence in Telecommunications Management. This new award aims to:

- Recognise excellence in communications management;
- Draw attention to examples of meritorious performance for the industry to emulate; and
- Identify best practices.

The award, sponsored by Amos Aked Swift Pty Ltd, will be presented during ATUG'93 to the ATUG Communications Manager of the Year, and an award will also be made to the runner-up. Once again, the best speaker during ATUG'93 will be awarded the Campbell McComas-sponsored Conover Stellar Award. Last year, the award was presented to Exicom's Voice Processing Division's General Manager, David Blanks. These awards are complimented by a number of prizes for competitions which are held during the four day ATUG conference and exhibition. ATUG'93 attendees and exhibition visitors should look out for these.

Wally Rothwell (left) and Campbell McComas (right) present the Conover Stellar Award to Exicom's David Blanks

ATUG

SYDNEY
Level 11, 80 Alfred Street
Milsons Point, NSW, 2061
Australia
Tel: (02) 957 1333, (008) 22 6281
Fax: (02) 925 0880
MELBOURNE
Unit 3, 8-12 Sandilands Street
South Melbourne, VIC, 3205
Australia
Tel: (03) 690 6395
Fax: (03) 699 9094

Because the DCT900 is digital, users get seamless handover of calls

phones, the system is designed to cater for up to 30,000 handsets per square kilometre in dense central business district areas.

World First

The DCT900 uses time division multiple access technology (TDMA) to ensure it uses the available spectrum efficiently. "It is the world's first digital cordless business communications system," Fitzgerald said. It is the digital nature of the signal that ensures the speech quality and enables seamless handover of calls as users move from one location to another.

Nira Australia is the Australian arm of the originators of the DCT900 system, Ericsson Radio Systems BV The Netherlands.

The company has been marketing and maintaining Teletracer Radio paging systems in all major regions of Australia since 1983.

Ericsson's DCT900: Claimed to be the world's first digital cordless telephone

ATUG'93 UPDATE

Changes To Small Business Seminar

10.30 **The Commitment to Service — the New Philosophy** Dennis Flentje, AOTC

12.00 **How We Want It To Work** June Robbins, Manager Market Planning, Optus Communications

14.30 **Managing Small Business Communications** Speaker to be announced

16.00 **Visions for the Future — The Products and Services We May Expect** Phillip Sykes, Manager, Integrated Communications Services, Telecom Research Laboratories

Changes To ATUG'93 Conference

Tuesday 11 May, 1993

Stream 1

16.00 **Austel — A Legal Review** Sheila McGregor, Freehill Hollingdale & Page

16.30 **Austel — A Standards Review** Rex Christenson, Austel

17.00 **Austel — A Technical Review** Bob Horton, Austel

Stream 2

16.00 **Fibre Technology — Present and Future** George Krebs, Alcatel

16.30 **Applications: The SE CBD Project** Barry Bennison, Sydney Electricity

17.00 **Whither The Copper Pair?** Jack Horenkamp, AT&T USA

Stream 3

16.00 **Advances in the Cordless Office** David Wright, UK Group Manager, GEC Plessey Communications

Wednesday 12 May, 1993

Stream 1

12.00 **Themes, Trends & Future Prospectives** Kjell Sorme, Ericsson Australia

15.00 **LAN Internetworking & Management** Mark Hoover, SynOptics

16.30 **The NSW Government Network** Charles Rizzo, BT Australia

Stream 2

14.30 **The Right Choice?** Stewart Fist, Journalist

15.00 **International Experience** Petri Poyonen, Nokia

16.30 **DMS Smart Switching for Smart Users** Graeme Barty, Nortel

Workshop 8

16.00 **Doing Information Technology Business in the People's Republic of China** Thomas Chiu, Sly & Weigall

Thursday 13 May, 1993

Stream 1

09.30 **The Emerging Role of the IT Manager** John Houghton, CIRCIT

Stream 2

11.00 **The Optus OSS** Martin Bostock, DEC

Stream 3

11.30 **Next Generation Satellites** Dr E H Kopp, Hughes

12.00 **Telephone in the Sky** Edward Scott, BT PLC.

Your Views on ATUG Seminars and Workshops

ATUG's growing concern about the need for industry training has led it to continue a series of workshops as a member service to improve the skills of communications professionals in the new competitive telecommunications environment.

In the past, the government monopolies Telecom and OTC were the principal sources of trained telecommunications engineers and technicians. To a lesser extent, the defence forces also contributed to our telecommunications skills base. However, the deregulated telecommunications marketplace has left a gap for proper training in telecommunications. For example, ATUG's 'Industry Training Program' book lists courses ranging from technology-specific training to more general business management, but also shows that the range is far from complete.

The new competitive environment has also opened a new field of business training for communications professionals. According to ATUG's business manager, Owen Richards, the traditional role of the corporate telecommunications manager is undergoing significant change.

"The manager who primarily built and maintained networks is losing relevance. Australia now has one of the most liberal telecommunications regimes in the world. The second carrier, third party providers, facility management, outsourcing and new technologies are creating a very new and different role for the communications manager. This new role centres on the manager as a value-added reseller of telecommunications products and services from the many competing external providers," he said.

As a result, ATUG designed its series of three workshops called 'The new Communications Manager,' 'Managing Customer and Supplier Relationships' and 'Building a Better Business Case.'

The first workshop was conducted by Sydney-based communications consultants Amos Aked Swift Pty Ltd's Senior Consultant, Brian White. It covered the new skills required in the deregulated marketplace and included such topics as outsourcing; strategic planning; funding and chargeback; meeting service level objectives; justifying expenditure; tendering; service contracts; staffing issues; and cost controls.

The second workshop was conducted by Tim O'Sullivan, director of Sydney-based Focus Communications Pty Ltd, and was designed to develop the skills of communications professionals to help them effectively facilitate and manage relationships between internal customers and external suppliers; to work in co-operation with salespeople to achieve win-win outcomes; to understand the supplier's particular perspective of selling; to develop a business focus in managing accounts; and to develop effective interpersonal and business relationships.

Further, ATUG in association with the law firm, Sly & Weigall, have put together a series of evening seminars called 'Exporting Information Technology to Asia,' The seminar discusses legal and regulatory requirements in Singapore, Thailand, Indonesia, China, Malaysia and Vietnam.

Despite the fact that these workshops and seminars are national and have been offered at a reduced rate for ATUG members, the response has not been as overwhelming as expected.

Generally, participants in the workshops and seminars have been satisfied with their content and quality, but there seems to be a lack of demand for them on a national basis.

ATUG is interested to learn from its members if they wish it to continue offering such training seminars and workshops. Members are invited to write to ATUG on this matter.

Please forward your response to the: Australian Telecommunications Users Group (ATUG), P.O. Box 357, Milsons Point, NSW, 2061.

ATUG

SYDNEY
Level 11, 80 Alfred Street
Milsons Point, NSW, 2061
Australia
Tel: (02) 957 1333, (008) 22 6281
Fax: (02) 925 0880
MELBOURNE
Unit 3, 8-12 Sandilands Street
South Melbourne, VIC, 3205
Australia
Tel: (03) 690 6395
Fax: (03) 699 9094

Latest Telecommunications Legislation Available on Disk

Eurofield Information Systems Pty Ltd (EIS) has released the latest version of the 'Telecommunications' diskette, part of the Electronic Law Book series, which includes the recent broadcasting legislation and amendments to the telecommunications statutes. The cost for the latest version is $145 for ATUG members. For further information, contact the ATUG office in Sydney on (02) 957 1333.

ATUG to Study Number Portability

ATUG has been raising the issue of number portability with the industry regulator, Austel, for the last twelve months, but progress on the matter has been slow. As a result, ATUG has announced its intention to commission an independent study on portability.

According to ATUG's issues manager, Alan Robertson, the study aims to provide essential hard data as a basis for a decision on the technical practicability and likely cost of making number transferability between carriers available to Australia's telephone users.

The issue of portability, that is, the ease with which customers can choose alternate service providers, is important because it has an affect on the development of a competitive telecommunications market.

Austel recognises that the portability of numbers for telecommunications services is directly relevant to competition in the telecommunications industry, but all that ATUG has heard regarding this matter are assertions that portability will be too expensive, take too long or not be technically feasible.

Telecom Australia, in response to the question of number portability, has stated that portability should only be considered if 'a very clear benefit can be seen to outweigh the costs, considered from a technical, economic, customer and end-user perspective.'

Furthermore, the national carrier has suggested that, in a market the size of Australia, 'considerable caution is necessary before deciding to introduce a special 'Australia-only' set of standards for portability.'

Thus, the purpose of the study is to determine how existing and future capabilities in switching technology may be taken advantage of to allow portability of telephone numbers, thereby maximising the benefits of competition for all customers.

Finding a Solution

As things stand at present, users would have to change their telephone numbers if they wished to have services provided by a different carrier. The problem with this is that many users may be reluctant to change carriers because of the administrative costs which would be involved in changing their telephone numbers. These costs would include the cost of new business cards, new stationery, new advertising material and even the possible loss of business due to the change of number.

In the US, this problem is being rectified as far as 800 services are concerned. The 800 Service was launched in 1967 by AT&T. The Service was originally used for call routing and was developed to replace operator collect calling. However, multiple 800 numbers were required (one number for intrastate and a different number for interstate) until the development and deployment of Common Channel Signalling (CCS#7) and the development of database access technology called the Weber Patent.

This technology allowed for the use of a single 800 number to route calls to a single location nationally. Thus, as from May 1, users of 800 services in the United States will not be required to change their number when shifting to a different carrier.

According to MCI, which has provided costing information on the 800 service common database used in the US, the cost for the intrastate services is about 0.2 cents per call and the cost for the interstate services is below 0.3 cents per call. The effect is increased value in the 800 services being provided.

ATUG believes that it's now time for Australia to look seriously at number portability for a number of services, and specifically, for digital cellular mobile telephone number services; special service numbers such as 008; and also for local numbers in the same geographic areas. "Our concern is that if this issue is not given some impetus it has every danger of falling by the wayside, and users will be denied the benefits that competition should give them," Robertson said.

The key companies involved in the number portability issue in Australia are the carriers — AOTC, Optus and Vodafone — together with the suppliers of switching exchange equipment, Alcatel, Ericsson and NorTel.

ATUG Celebrates Birthday in Canberra

ATUG in Canberra will be celebrating its sixth birthday with a dinner on Thursday, 20th May, 1993. The birthday dinner will be sponsored by AAP Communications. Last year the dinner was sponsored by Optus Communications and was well attended, with around 200 people. For further details, members should contact ATUG's ACT Secretary, Anita Gracie, on (06) 287 0333.

May

10-13 **ATUG '93**, Sydney Convention and Exhibition Centre, Sydney. The 10th annual conference and exhibition of the Australian Telecommunications Users Group. The conference stream comprises three days of technical, regulatory, service and management sessions, while the exhibition will feature a wide range of business and commercial communications equipment. Additionally, there will be a one-day communications update seminar which will provide a round-up of telecommunications events over the past 12 months, and a one-day small business seminar, which is aimed at helping telecommunications users in small business improve their efficiency and planning. Three day conference fee: $850 (Member), $1,075 (Non-Member). Enquiries — ATUG Tel: (02) 957 1333 Fax: (02) 925 0880.

17-19 **Network Security**, Parkroyal, Darling Harbour, Sydney. A three-day comprehensive course that aims to help attendees determine the types of security controls needed in their networks. Participants will learn to determine the types of controls needed, how to minimise security risks in accordance with corporate security policies, how to identify controls not provided in network management products, and how to identify possible security breaches before they occur. Major network software and hardware vendors will provide the latest information on security developments and issues. Fee: $1,443. Enquiries — MTE Tel: (02) 261 5555 Fax: (02) 261 5959.

17-22 **Asia Telecom '93**, World Trade Centre, Singapore. Asia Telecom '93 will provide a platform for the exchange of information on technological advancements, and technical, policy, economic and regulatory developments. The exhibition will be the biggest event in the region, attracting some 150 exhibitors from 30 countries.The Asian region is the world's fastest-growing telecommunications market — there's space for 300 million more lines and for up to $US1,000 billion in investments in the next 50 years. The four Symposia of the Asia Telecom '93 Forum — Policy, Technical, Regulatory and Economic — are attracting the most influential players in the telecommunications industry. Enquiries — Suzan Hee-Sook Lee, Project Manager, Asia Telecom '93. Tel: +41 22 915 5811 Fax: +41 22 740 1013.

18-19 **Designing and Implementing FDDI LANs**, MM Data Networks, Melbourne. A comprehensive two-day training course containing theoretical sessions, practical exercises, case studies, demonstration networks and management and analysis equipment. The course will teach participants the concepts, hardware, design rules and applications of FDDI. Additionally, participants will learn how to configure and install FDDI equipment, and how to diagnose and solve problems in an FDDI network. Enquiries — MM Data Networks Tel: (02) 980 6922 Fax: (02) 980 6795.

20-21 **LAN Performance, Security and Reliability**, Parkroyal Hotel, Melbourne. This course aims to improve participants' ability to spot and rectify network problems before they become major headaches, and also to show how to determine whether network traffic is secure. Using diagnostic tools for Ethernet and Token Ring, participants will learn how to read and manage network traffic, using over 100 dynamic tests to measure network performance. Participants will also learn how the design of a network affects its performance, methods for establishing network performance threshold alarms and how to load balance network file servers. Fee: $995. Enquiries — AIC Training Tel: (02) 235 1700 Fax: (02) 223 8216.

24-25 **Multimedia**, Hilton Hotel, Sydney. This course will demonstrate how multimedia can be successfully deployed by businesses to increase efficiency and competitiveness. Participants will get a broad overview of multimedia trends and standards, as well as practical advice on how to incorporate this new technology into the business environment. Special presentations will also be given by Apple, Microsoft, Intel and Sony. Fee: $1,146. Enquiries — MTE Tel: (02) 261 5555 Fax: (02) 261 5959.

June

1-2 **Demystifying LANs**, Gazebo Hotel, Sydney. This seminar aims to give CIOs, MIS Managers and Data Communications Managers a thorough overview of local area networking technology and a solid foundation in networking fundamentals. It covers local area networking topologies; cabling and access methods; protocols and architectures; the role of hubs, bridges, routers and gateways; network operating systems; and the use of network management tools. The issues of security and network reliability will also be discussed, The course will be conducted over two days. Fee: $994. Enquiries — MTE Tel: (02) 261 5555 Fax: (02) 261 5959.

9-11 **World Trends in Telecommunications Corporatisation and Privatisation**, Taipei, Taiwan. The Pacific Telecommunications Council is holding this seminar, during which delegates can learn about the experiences of telecommunications organisations and international corporations working in the region. Participants will be updated on regulatory trends and policy shifts in Taiwan and the East and Southeast Asian and Pacific countries. A key feature of the event will be specially arranged site visits to Taiwan's state-of-the-art telecommunications facilities. Fee: $US50. Enquiries — PTC Tel: +1-808-941-3789 Fax: +1-808-944-4874.

21-23 **EDI in the Public Sector**, Hyatt Hotel, Canberra. This seminar will provide attendees with a sound understanding of government EDI policy and initiatives. Also covered are issues such as cost/benefit analysis of EDI implementation, infrastructure options for networks and corporate gateways, and the security issues that need to be addressed. Two-day conference and workshop fee $1,795; conference only $1,295; workshop only $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

22-23 **ATM**, Parkroyal Hotel, Darling Harbour Sydney. A two-day seminar on this very important emergent technology, the program features key industry speakers, and covers a wide variety of topics including the advantages and financial benefits of ATM technology, the availability of ATM products, and the cost of implementation and migration. A case study will also be presented to give attendees a feel for practical ATM implementation. This seminar will also be held in Melbourne on June 28-29. Fee: $1,146. Enquiries — MTE Tel: (02) 261 5555 Fax: (02) 261 5959.

28-30 **Privatising and Financing Telecommunications**, Shangri-La Hotel, Kowloon, Hong Kong. The 1993 Pan-Asian Summit this year focuses on issues of privatisation and increased market competitiveness, covering such topics as how to finance infrastructure projects and industry and market experiences in Asia. The Summit includes case studies from 10 countries in the region, and attendees will gain insights into development policies and market and investment opportunities. There is also a half-day workshop on privatisation policy, planning and practice. Fee: $US1,895. Enquiries —IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

July

7-9 **The 1993 Pan Asian Mobile Communications Summit**, Singapore. This conference will be held in both Singapore and Hong Kong, and will cover mobile services policy and planning in Asian markets, GSM Asia-Pacific roll out experiences, satellite personal communications, Digital AMPs, JDC and CDMA implementation experiences, and regional developments in Australia, Hong Kong, Singapore, Indonesia, Malaysia, Phillipines and Japan. The Hong Kong conference will be held on July 12-14. Fee: $US1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

12-14 **Network Cabling Design**, Maritime Conference Centre, Sydney. This intensive hands-on seminar is designed for people involved in managing and installing networks, and covers areas such as cabling standards; cable construction, uses and transmission methods; network test equipment; preparing cabling cost estimates; and future cabling trends. The course will also be held in Melbourne later in the year. Fee: $1,445. Enquiries — IIT Training Tel: (02) 959 5990 Fax: (02) 956 6375.

September

20-22 **Understanding Data Communications Networks**, Maritime Conference Centre, Sydney. This course aims to give professionals working in data communications a thorough grounding in communications protocols and standards, modem terminology and technology, hardware and software interfaces, multiplexers, and transmission media and their uses. Fee: $1,445. Enquiries — ITT Training Tel: (02) 959 5990 Fax: (02) 956 6375.

27-1/10 **ASWEC '93**, Hyatt Kingsgate, Sydney. The 7th Australian Software Engineering Conference has the theme this year of 'Software Quality and Other Urban Myths,' and will feature papers on CASE, development environments, management of software developments and technical innovations. Enquiries — Institution of Radio and Electronics Engineers Australia Tel: (02) 327 4822 Fax: (02) 362 3229.

October

26-28 **The Inmarsat International Conference and Exhibition on Mobile Satellite Communications** CNIT, Paris. The first Inmarsat conference and exhibition in 1989 focused on the development of mobile communications. This year the conference will be addressing the future of mobile satellite communications, and senior-level speakers will offer their views on a range of issues covering all aspects of the industry. The exhibition will also show the latest equipment and applications in the field of mobile satellite communications. Enquiries — Tania Starley, IBC Technical Services Tel: +44 71 637 4383 Fax: +44 71 631 3214.

November

28-1/12 **ACOFT-18 '93**, Northbeach Parkroyal Hotel, Wollongong. The 18th Australian Conference on Optical Fibre Technology will cover the latest research, developments, production applications and business strategies of optical fibres, waveguides, sources, detectors and other services for the telecommunications and sensors industries. A trade exhibition will be held in conjunction with the conference. Enquiries — Conference Secretary, IREE Tel: (02) 327 4822 Fax: (02) 362 3229.

Having Trouble Getting the Message Through???

TELEPHONE PAGING

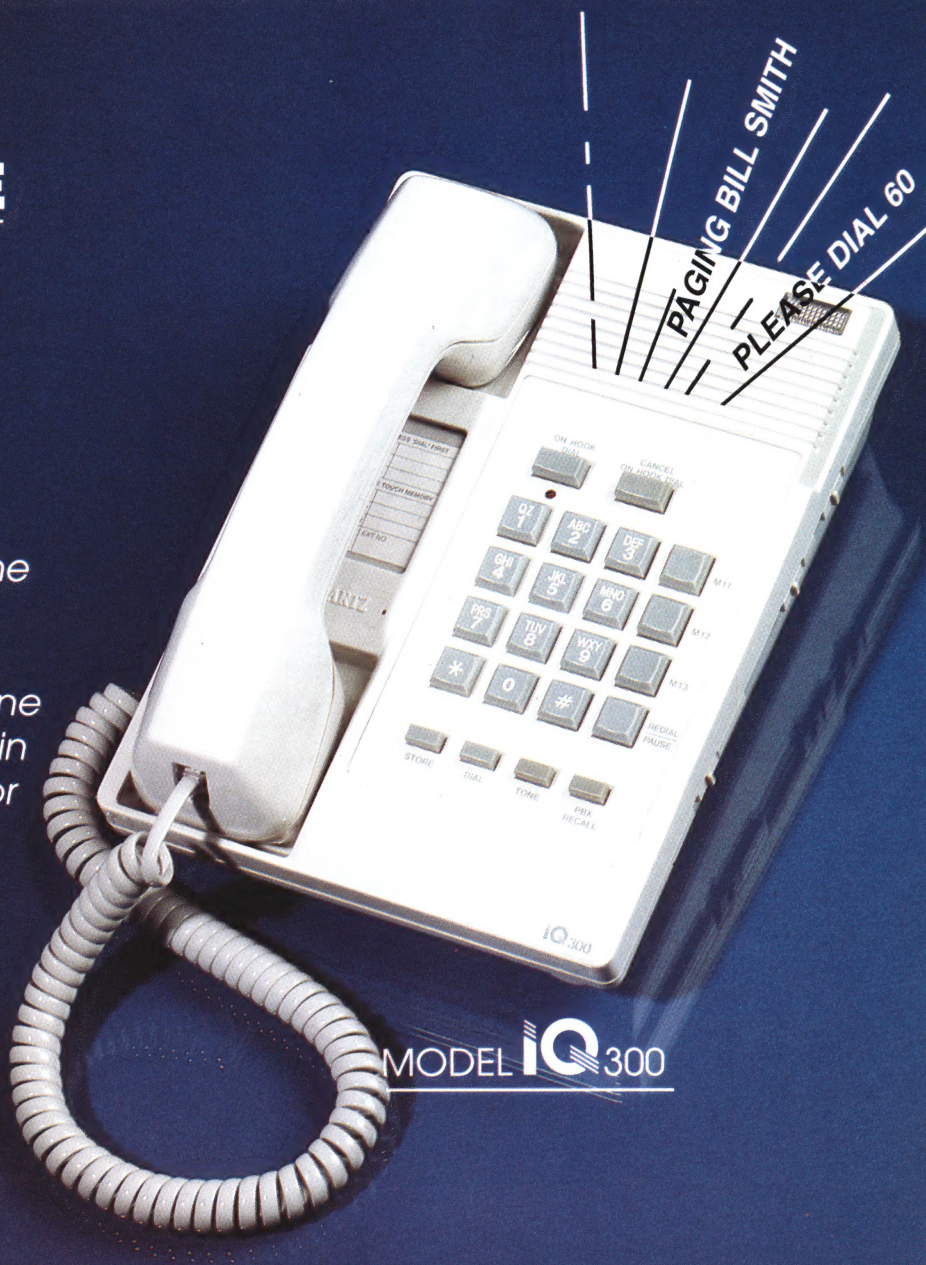
Through Your Interquartz Business Telephone is The Answer

IQTEL-EPAGE

By INTERQUARTZ®

Discreet Paging through 10 Interquartz phones or 1000 Interquartz phones is no problem for IQTEL-EPAGE

You can page from any phone by simply dialling an access number and make your announcement to every phone user in the building or a certain section only - ie warehouse, or just one phone user.



AUSTEL
AUSTRALIAN TELECOMMUNICATIONS AUTHORITY

Only products that carry an AUSTEL Permit have been tested to meet AUSTEL's safety and technical standards.

IQ INTERQUARTZ®, The leaders in Business Phones can now offer Your Business a smart and Economical way to add this super efficient Paging System. All you need to have is a PABX and we can do the rest.

IQ INTERQUARTZ® THE MANUFACTURERS AND DISTRIBUTORS

INTERQUARTZ (A'ASIA) PTY. LTD

MELBOURNE
42 DOUGHARTY ROAD,
WEST HEIDELBERG, VIC. 3081
TELEPHONE: (03) 457 5000
FAX: (03) 458 4049

SYDNEY
8 PIONEER AVENUE,
THORNLEIGH, N.S.W. 2120
TELEPHONE: (02) 875 4011
FAX: (02) 875 4146

CANBERRA
TELEPHONE: (06) 243 4860
FAX: (06) 243 4848

BRISBANE
4/12 TOLMER PLACE,
SPRINGWOOD, QLD, 4127
TELELPHONE: (07) 808 8008
FAX: (07) 808 8666

TOLL FREE: 008 333 131 AUSTRALIA

Initial Release Victoria and New South Wal

To provide communications of the future, Australia's telephone exchanges are being updated now.

Not long ago, the video phone was something you would only see in science-fiction movies.

But before the end of the decade it will be a reality, in thousands of homes and businesses across Australia.

And many more exciting developments in the world of communications will soon become available, thanks to the new Alcatel 1000 System 12 currently being delivered to Australia's telephone exchanges.

Of course, this is an enormous, highly technical and costly task. But it's satisfying to know that one company in Australia has the engineering and manufacturing know-how to build and supply this state of the art equipment.

Alcatel Australia. We're Australia's largest communications company because we know how to compete.

ALCATEL
AUSTRALIA

C&M ALC 0063/R